SAMSUNG ELECTRONICS

SAMSUNG

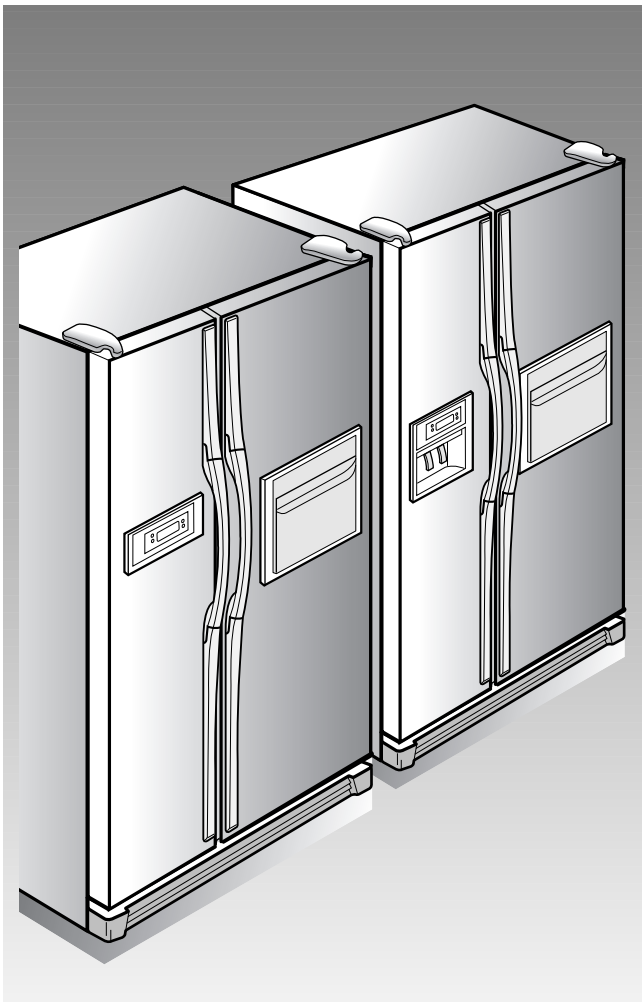## Model : SR-S2026C(D) SR-S2226C(D)
SR-S2027C(D) SR-S2227C(D)
SR-S2028C(D) SR-S2228C(D)
SR-S2029C(D) SR-S2229C(D)

SR-S20NTC(D) SR-S22NTC(D)
SR-S20BTC(D) SR-S22BTC(D)
SR-S20DTC(D) SR-S22DTC(D)
SR-S20FTC(D) SR-S22FTC(D)

SERVICE Manual

REFRIGERATOR

Contents

1. Product Specifications

Item		Specification			
Model		SR-S2026C(D) SR-S20NTC(D) Basic	SR-S2027C(D) SR-S20BTC(D) Basic & H/B	SR-S2028C(D) SR-S20DTC(D) Dispenser	SR-S2029C(D) SR-S20FTC(D) Dispenser & H/B
Net Capacity	**Total**	562ℓ		540ℓ	
	Refrigerator	349ℓ		349ℓ	
	Freezer	213ℓ		191ℓ	
Net dimension(W × H × D)		908mm × 719(724)mm × 1760mm			
Rated Frequency and Frequency		230~240V/50Hz			
Motor Rated Consumption Power		155W		160W	
Electric Heater Rated Consumption Power		350W	360W	355W	365W
Kind of Refrigerator		Indirect Cooling Method Refrigerator			
Refrigerant		HFC-134a			
Refrigerant Input Amount		190gr			
Freezer Performance		✱ ✱✱✱ (4-STAR)			
Product Weight		111Kg	111Kg	117Kg	117Kg

Item		Specification			
Model Name		SR-S2226C(D) SR-S22NTC(D) Basic	SR-S2227C(D) SR-S22BTC(D) Basic & H/B	SR-S2228C(D) SR-S22DTC(D) Dispenser	SR-S2229C(D) SR-S22FTC(D) Dispenser & H/B
Net Inside Capacity	Total Inside Capacity	599ℓ		569ℓ	
	Freezer	227ℓ		197ℓ	
	Refrigerator	372ℓ		372ℓ	
Outer Size (width × depth × height)		908mm × 754(759)mm × 1760mm			
Rated Frequency and Frequency		230~240V/50Hz			
Motor Rated Consumption Power		155W		160W	
Electric Heater Rated Consumption Power		350W	360W	355W	365W
Kind of Refrigerator		Indirect Cooling Method Refrigerator			
Refrigerant		HFC-134a			
Refrigerant Input Amount		190gr			
Freezer Performance		✱ ✱✱✱ (4-STAR)			
Product Weight		121Kg	121Kg	127Kg	127Kg

Read all instructions before using this product and keep to the instructions in order to prevent danger or property damage.

CAUTION/WARNING SYMBOLS DISPLAYED

 Warning — Indicates that a danger of death or serious injury exists.

 Caution — Indicates that a risk of personal injury or material damage exists.

SYMBOLS

⊘ means "Prohibition".

means "Do not disassemble".

✋ means "No contact".

❗ means "The things to be followed".

means "Power cord should be unplugged from the consent"

⏚ means "Earth to prevent Electric shock".

⚠ Warning

Do not insert the power plugs for many products at the same time.

● *May cause abnormal generation of heat or fire.*

Prohibition
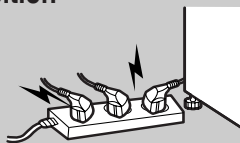
Do not disassemble, repair or alter.

● *It may cause fire or abnormal operation which leads to injury.*

Do not disassemble
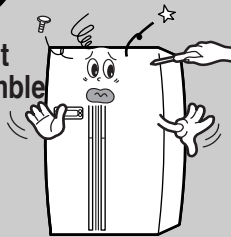
Do not bend the power cord with excessive force or do not have the power cord pressed by heavy article.

● *May cause fire.*
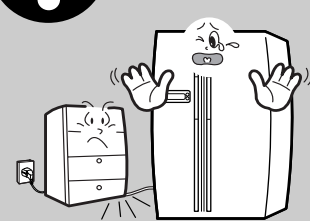
Do not install the refrigerator in the wet place or the place which water splashes.

● *Deterioration of insulation of electric parts may cause electric shock or fire.*
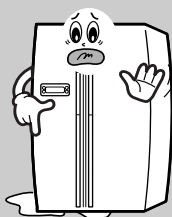
Make sure of the earth.

● *If earthing is not done, it will cause breakdown and electric shock.*

Earth
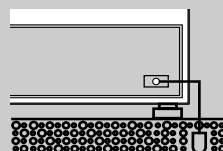
Pull the power plug out to exchange the interior lamp of the refrigerator.

● *It may cause electric shock.*
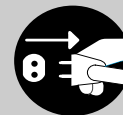
Unplug
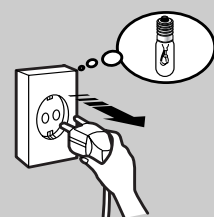
⚠ **Caution**

Do not put bottles or kinds of glass in the freezer.

● *Freezing of the contents may inflict a wound.*
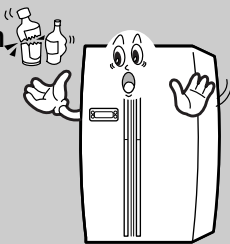
🚫 **Prohibition**

Do not store narrow and lengthy bottles or foods in a small multi-purpose room.

● *It may hurt you when refrigerator door is opened and closed resulting in falling stuff down.*

🚫 **Prohibition**

Do not store pharmaceutical products, scientific materials, etc., in the refrigerator.

● *The products which temperature control should not be stored in the refrigerator.*

🚫 **Prohibition**
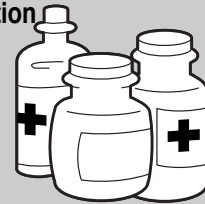
Do not store articles on the product.

● *Opening or closing the door may cause things to fall down, with may inflict a wound.*
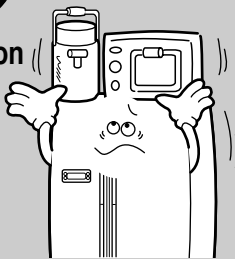
🚫 **Prohibition**

Use the rated components on the replacement.

● *Check the correct model, rated voltage, rated current, operating temperature and so on.*

❗

Rated components

On repair, make sure that the wires such as harness are bundled tightly.

● *Bundle tightly wires in order not to be detached by the external force and then not to be wetted.*

❗

On repair, remove completely dust or other things of housing parts, harness parts, and check parts.

● *Cleaning may prevent the possible fire by tracking or short.*

❗
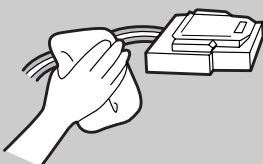
After repair, check the assembled state of components.

● *It must be in the same assembled state when compared with the state before disassembly.*
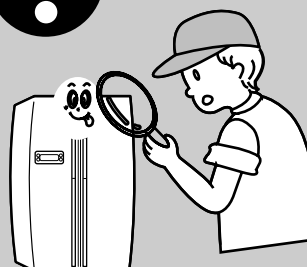
❗

Check if there is any trace indicating the permeation of water.

● *If there is that kind of trace, change the related components or do the necessary treatment such as taping using the insulating tape.*

❗
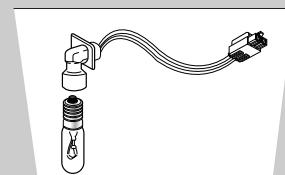
3. Specifications of Electric Components

Items			Specification	
Models			SR-S20..~SR-S22..	
Freezing Capacity			✱ ✱✱✱ (4 STAR)	
Components for Freezer	Compressor	Model	DK182Q-L2U	
		Starting type	R.S.C.R	
		Oil Charge	FREOL α - 15 (ESTER)	
	Evaporator	Freezer	SPLIT FIN TYPE	
		Refrigerator	SPLIT FIN TYPE	
	Condenser		Forced and natural convection type	
	Dryer		Molecular sieve XH-9	
	Capillary tube		0.82×3000, 5.5 Kg/cm^2	
	Refrigerant		HFC-134a	
Room Temperature Sensor Components	Freezer	Model	Temperature Selection	ON(˚C)	OFF(˚C)
		THERMISTOR (F-SENSOR) 502AT	-26˚C	-25.0	-27.0
			-20˚C	-19.0	-21.0
			-14˚C	-13.0	-15.0
	Refrigerator	Model	Temperature Selection	ON(˚C)	OFF(˚C)
		THERMISTOR (R-SENSOR) 502AT	-1˚C	0.0	-2.0
			3˚C	4.0	2.0
			7˚C	8.0	6.0
Defrost Related Components	Defrost Cycle	First Defrost Cycle (Concurrent defrost of F and R)	4 hr ± 10 min	
		Defrost Cycle(FRE)	12 ~ 38 hr (vary according to the conditions used)	
		Defrost Cycle(REF)	6 ~ 19 hr (vary according to the conditions used)	
		Pause time	10 ± 2 min	
	Defrost Sensor	F Defrost-Sensor	Model	THERMISTOR (502AT)	
			SPEC	5.0㏀ at 25˚C	
		R Defrost-Sensor	Model	THERMISTOR (502AT)	
			SPEC	5.0㏀ at 25˚C	
	Thermal-Fuse		Rated	AC 250V 10A	
			Operating temperature	72 ± 4˚C	

Items			Specifications			
Model			SR-S2026, S2226 SR-S20NTC,S22NTC	SR-S2027, S2227 SR-S20BTC,S22BTC	SR-S2028, S2228 SR-S20DTC,S22DTC	SR-S2029, S2229 SR-S20FTC,S22FTC
Electric Components	Defrost-Heater(FRE)	Conducting at F Defrosting	200 W		200 W	
	Defrost-Heater(REF)	Conducting at R Defrosting	100 W		100 W	
	DRAIN Heater(FRE)	Conducting at F Defrosting	25 W		25 W	
	DRAIN Heater(REF)	Conducting at R Defrosting	25 W		25 W	
	DISPENSER Heater	Interlock with F-FAN	-	-	5W	5W
	HOME-BAR Heater	Interlock with COMP	-	10W	-	10W
	Thermal-Fuse for preventing overheating of Freezer Defrost-Heater		AC 250V 10A 72 $\pm$ 4°C			
	Thermal-Fuse for preventing overheating of Refrigerator Defrost-Heater					
	Compressor		DK182Q-L2U			
	Condenser for COMP (Package type)	Running	350VAC-5μF			
		Starting	-			
	Starting-Relay	Model	J531Q35E330M385-2			
		Operation	33 Ω $\pm$ 20%			
	Over-load Relay	Model	4TM265RFBYY-53			
		Temp. ON	130 $\pm$ 5°C			
		Temp. OFF	69 $\pm$ 9°C			
	Rated Voltage		230V/50,60Hz			
	MOTOR-BLDC(FRE)		240V/50Hz UDQMOO2H4ASS			
	MOTOR-BLDC(REF)		240V/50Hz UDQMOO2H4ASS			
	MOTOR-BLDC (Circuit)		240V/50Hz UDQMOO2H4ASS			
	Lamp(FRE)		AC240V/30W			
	Lamp(REF)		AC240V/30W $\times$ 2			
	Door Switch		AC250V 0.5A $\times$ 2			
	Door Switch (HOME-BAR)		AC250V 0.5A			
	Dispenser Switch		DECO 250VAC 6A			
	Power cord		AC250V 12A			
	Earth Screw		BSBN (BRASS SCREW)			

4. Circuit Diagram

For Basic & With Home Bar Models (SR-S2026, S2027, S2226, S2227/S20NTC,S20BTC,S22NTC,S22BTC)

Reference

RED-RED	WHT-WHITE
BLU-BLUE	YEL-YELLOW
ORG-ORANGE	BLK-BLACK
P/BLU-PINK/BLUE	PRP-PURPLE
BRN-BROWN	W/BLK-WHITE/BLACK
PNK-PINK	S/BLU-SKY/BLUE
GRY-GRAY	E-EARTH
W/BLU-WHITE/BLUE	W/RED-WHITE/RED
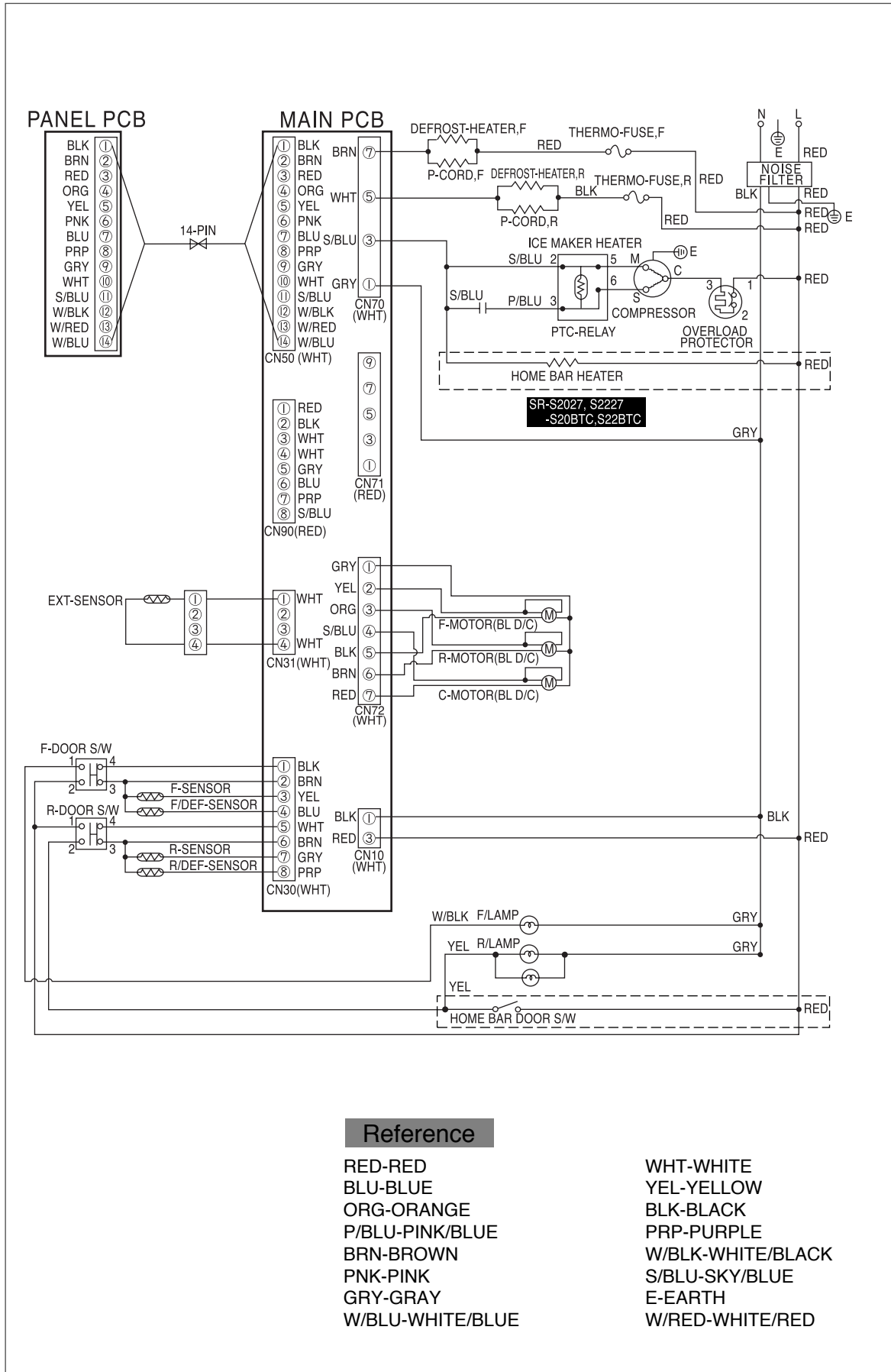
For Dispenser & With Home Bar Models (SR-S2028, S2029 S2228, S2229/S20DTC, S20FTC,S22DTC,S22FTC)

PANEL PCB

BLK	①
BRN	②
RED	③
ORG	④
YEL	⑤
PNK	⑥
BLU	⑦
PRP	⑧
GRY	⑨
WHT	⑩
S/BLU	⑪
W/BLK	⑫
W/RED	⑬
W/BLU	⑭

14-PIN

MAIN PCB

①	BLK
②	BRN
③	RED
④	ORG
⑤	YEL
⑥	PNK
⑦	BLU
⑧	PRP
⑨	GRY
⑩	WHT
⑪	S/BLU
⑫	W/BLK
⑬	W/RED
⑭	W/BLU

CN50 (WHT)

BRN ⑦ — DEFROST-HEATER,F — RED — THERMO-FUSE,F
P-CORD,F
WHT ⑤ — DEFROST-HEATER,R — BLK — THERMO-FUSE,R — RED
P-CORD,R — BLK — RED
S/BLU ③ — ICE MAKER PIPE HEATER
GRY ① — CN70 (WHT)

N L
E RED
NOISE FILTER
BLK
RED
RED
RED E

S/BLU 2 5 M E
6 C
S/BLU P/BLU 3 S COMPRESSOR 3 1
RUNNING CAPACITOR PTC-RELAY 2 OVERLOAD PROTECTOR
RED

BLU BLU
DISPENSER S/W DISPENSER HEATER RED
HOMEBAR HEATER RED
GRY

SR-S2029, S2229 -20FTC,S22FTC

W/BLK ⑨
PRP ⑦ — DISPENSER SOLENOID — RED
PNK ⑤ — ICE SOLENOID — FILTER — RED
BLU ③ — RED
CN71 (RED)
E
AUGER-MOTOR
ICE CUBE SOLENOID

ICE-MAKER KIT

EJECT-MOTOR M ⑩ — ① RED
⑨ — ② BLK
EJECT-SENSOR ⑦ — ③ WHT
⑥ — ④ WHT
TEST ⑤ — ⑤ GRY
HORIZONTAL S/W ③ — ⑥ BLU
ICE FULL S/W ② — ⑦ PRP
① — ⑧ S/BLU
CN90(RED)

GRY ① WATER-SOLENOID
YEL ② WATER-S/W
ORG ③ GRY VALVE
S/BLU ④ F-MOTOR(BL D/C) M FILTER BLK RED
BLK ⑤ R-MOTOR(BL D/C) M
BRN ⑥ C-MOTOR(BL D/C) M GRY
RED ⑦
CN72 (WHT)

EXT-SENSOR ① — ① WHT
② — ② ORG
ICE-S/W ③ — ③ ORG
④ — ④ WHT
CN31(WHT)

F-DOOR S/W
1 4
2 3
R-DOOR S/W
1 4
2 3

① BLK
② BRN
F-SENSOR ③ YEL
F/DEF-SENSOR ④ BLU
⑤ WHT
R-SENSOR ⑥ BRN
R/DEF-SENSOR ⑦ GRY
⑧ PRP
CN30(WHT)

BLK ① BLK
RED ③ RED
CN10 (WHT)

W/BLK F/LAMP GRY
YEL R/LAMP GRY
YEL
HOME BAR DOOR S/W RED

Reference

RED-RED	WHT-WHITE
BLU-BLUE	YEL-YELLOW
ORG-ORANGE	BLK-BLACK
P/BLU-PINK/BLUE	PRP-PURPLE
BRN-BROWN	W/BLK-WHITE/BLACK
PNK-PINK	S/BLU-SKY/BLUE
GRY-GRAY	E-EARTH
W/BLU-WHITE/BLUE	W/RED-WHITE/RED

5. Dimension & part name of refrigerator

5-1) Product Dimension (SR-S2026, S2027, S2226, S2227/S20NTC,S20BTC,S22NTC,S22BTC)

(SR-S2027, S2227)
-S20BTC,S22BTC
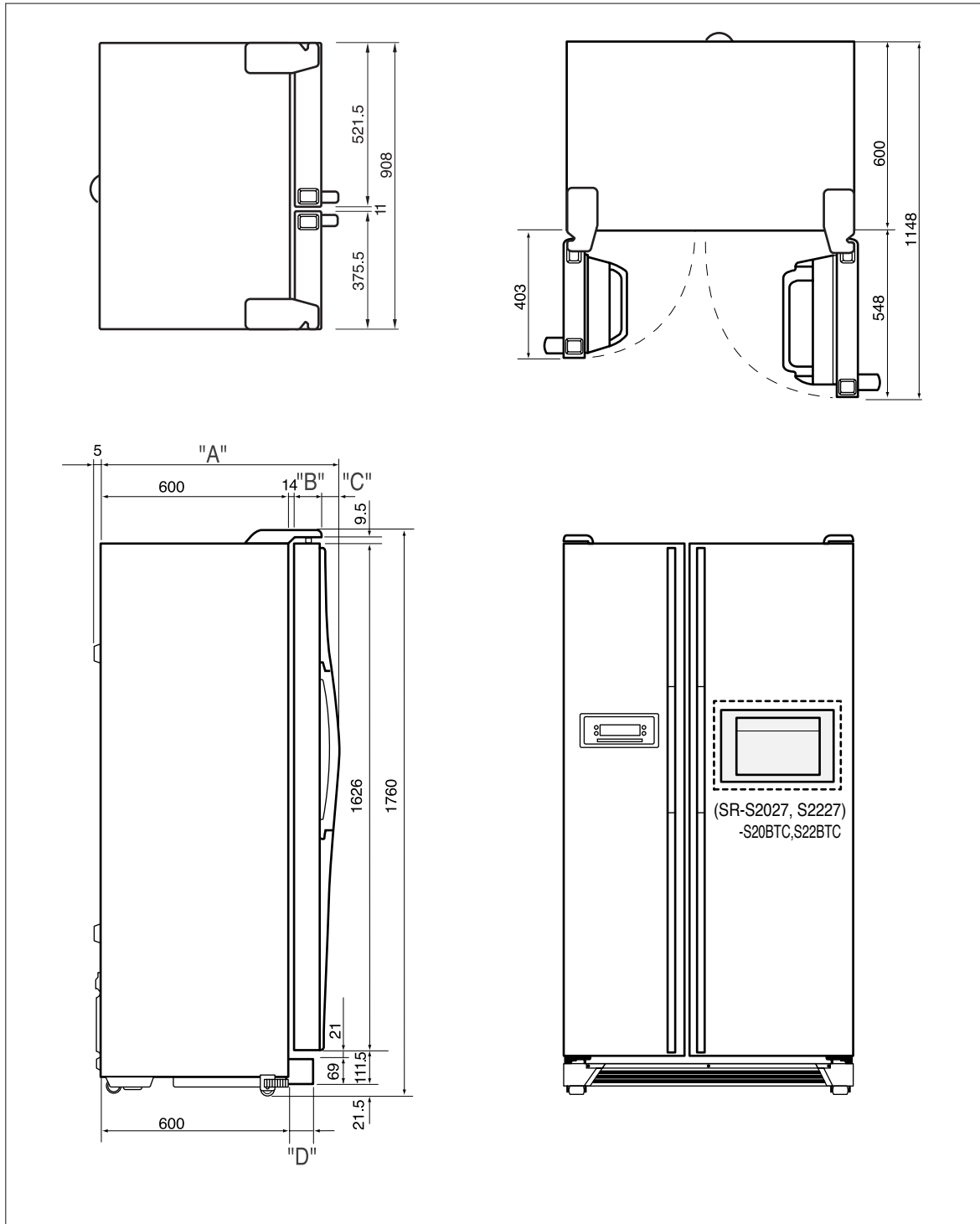
MODEL	"A"	"B"	"C"	"D"
SR-S2026C, S2027C/S20NTC,S20BTC(D)	719	50	55	54
SR-S2026D, S2027D/S20NTC(D),S20BTC(D)	714	50	50	54
SR-S2226C, S2227C/S22NTC,S22BTC(D)	754	85	55	89
SR-S2226D, S2227D/S22NTC(D),S22BTC(D)	749	85	50	89

5-2) Product Dimension (SR-S2028, S2029, S2228, S2229/S20DTC,S20FTC,S22DTC,S22FTC)

(SR-S2029, S2229)
-S20FTC,S22FTC
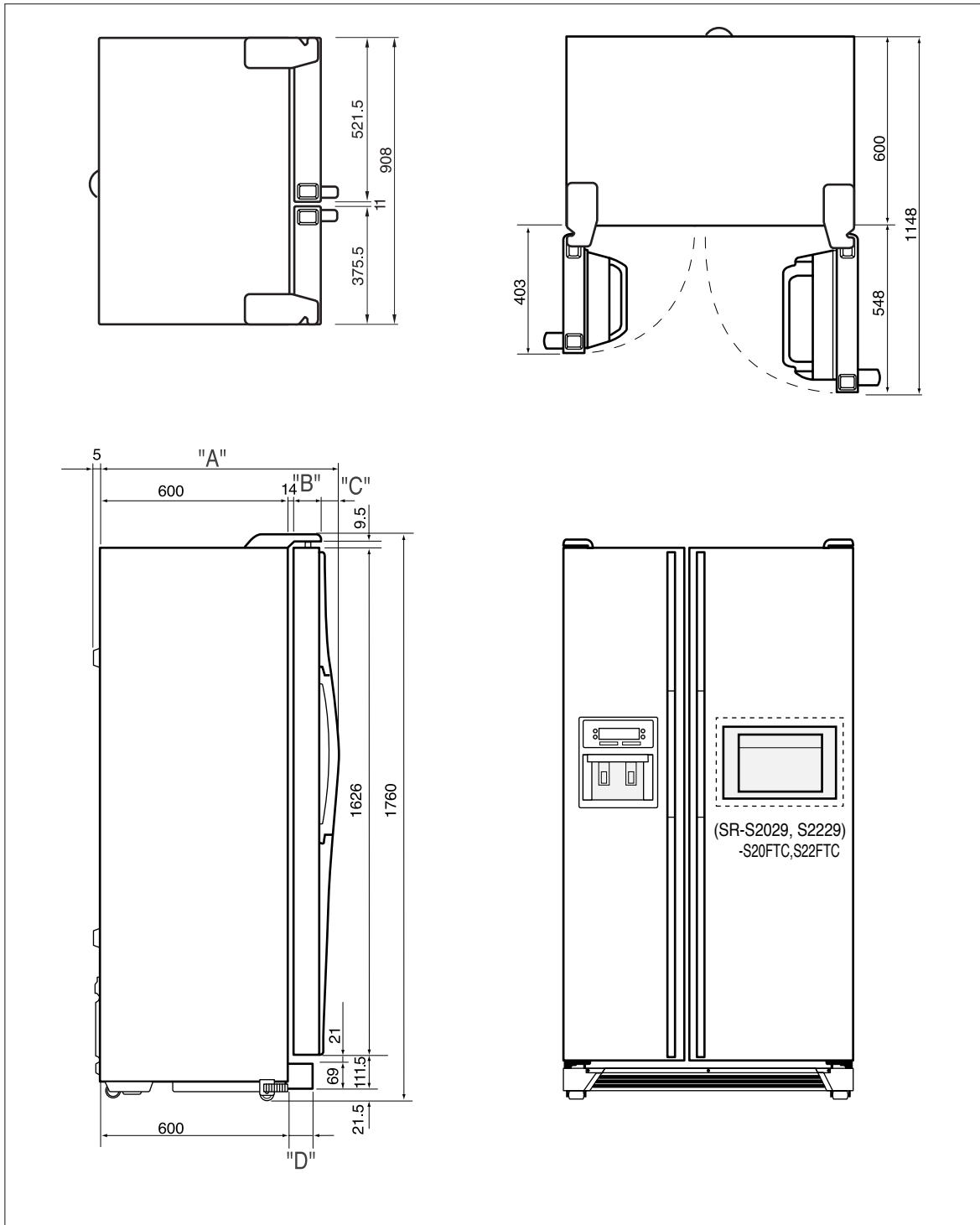
MODEL	"A"	"B"	"C"	"D"
SR-S2028C, S2029C/S20DTC,S20FTC(D)	719	50	55	54
SR-S2028D, S2029D/S20DTC(D),S20FTC(D)	714	50	50	54
SR-S2228C, S2229C/S22DTC,S22FTC(D)	754	85	55	89
SR-S2228D, S2229D/S22DTC(D),S22FTC(D)	749	85	50	89

FREEZER

① LAMP-INCANDESCENT

② SHELF

③ GUARD

④ TRAY-ICE & ICE

⑤ CASE-BASKET

⑥ COVER-LEG, FRONT

REFRIGERATOR

⑦ COVER-GUARD

⑧ LAMP-INCANDESCENT

⑨ SHELF

⑩ TRAY-CHILLED ROOM

⑪ TRAY-EGG

⑫ GUARD
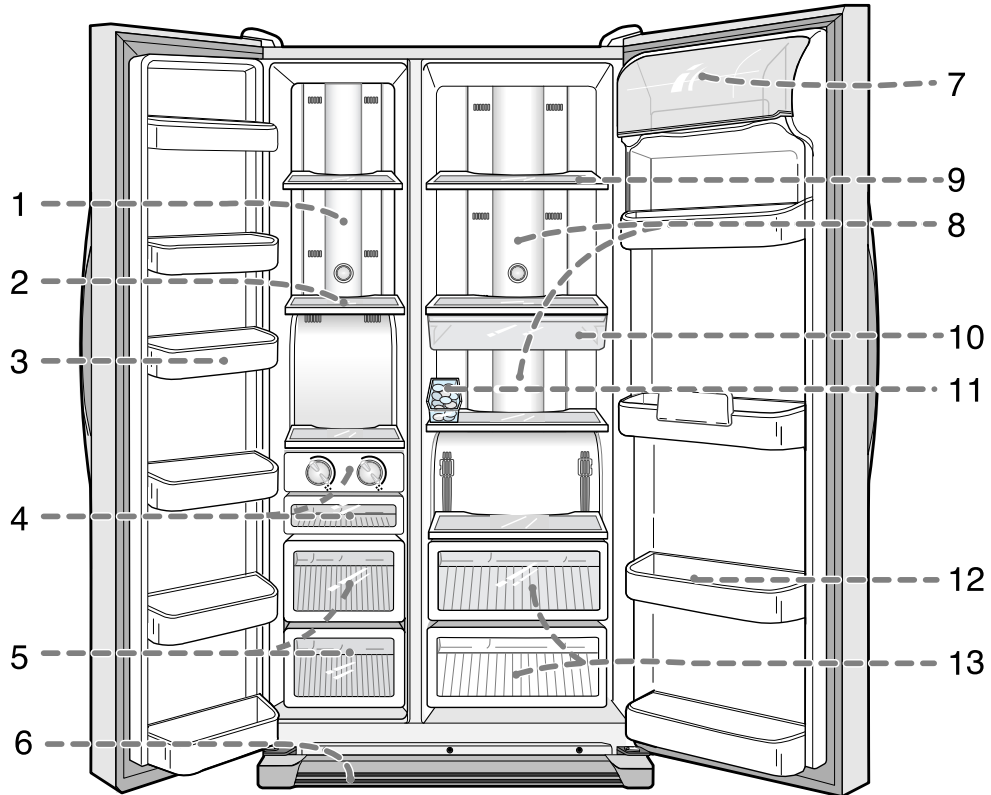
⑬ CASE-VEGETABLE

FREEZER	REFRIGERATOR
① LAMP-INCANDESCENT	⑦ COVER-GUARD
② SHELF	⑧ LAMP-INCANDESCENT
③ GUARD	⑨ SHELF
④ TRAY-ICE & ICE	⑩ TRAY-CHILLED ROOM
⑤ CASE-BASKET	⑪ TRAY-EGG
⑥ COVER-LEG, FRONT	⑫ GUARD
	⑬ CASE-VEGETABLE
	⑭ HOME-BAR
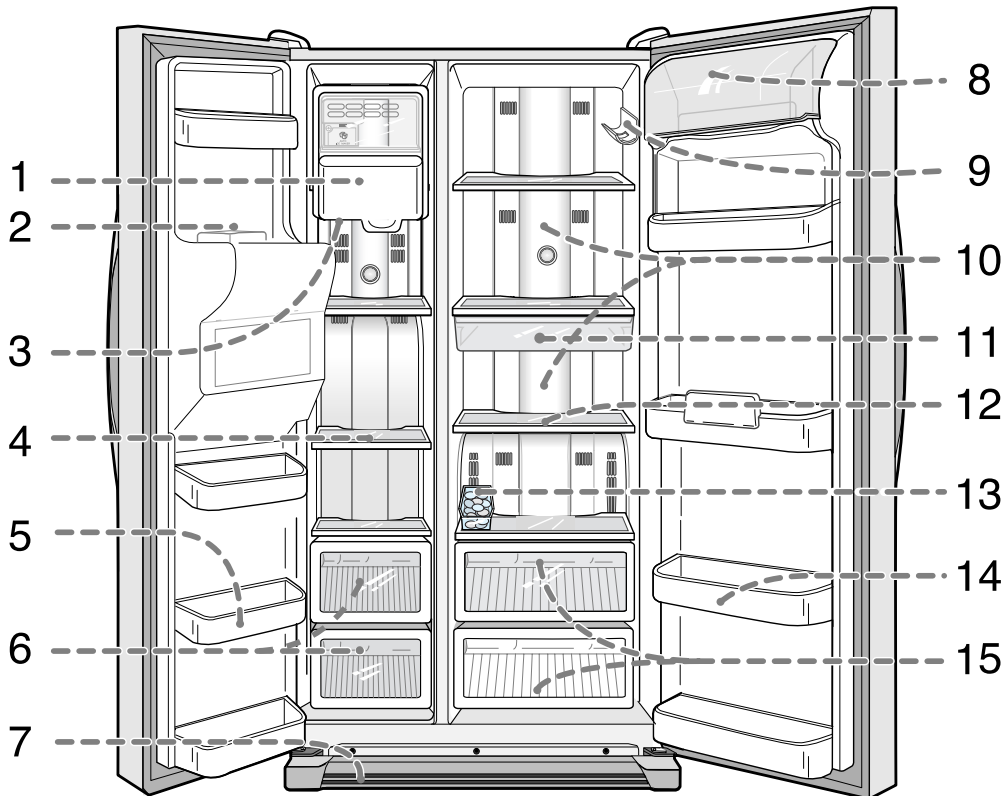
FREEZER	**REFRIGERATOR**
① ICE-MAKER	⑧ COVER-GUARD
② ICE-CHUTE	⑨ SHELF-WINE
③ LAMP-INCANDESCENT	⑩ LAMP-INCANDESCENT
④ SHELF	⑪ TRAY-CHILLED ROOM
⑤ GUARD	⑫ SHELF
⑥ CASE-BASKET	⑬ TRAY-EGG
⑦ COVER-LEG, FRONT	⑭ GUARD
	⑮ CASE-VEGETABLE

FREEZER	**REFRIGERATOR**

① ICE-MAKER

② ICE-CHUTE

③ LAMP-INCANDESCENT

④ SHELF

⑤ GUARD

⑥ CASE-BASKET

⑦ COVER-LEG, FRONT

⑧ COVER-GUARD

⑨ SHELF-WINE

⑩ LAMP-INCANDESCENT

⑪ TRAY-CHILLED ROOM

⑫ SHELF

⑬ TRAY-EGG

⑭ GUARD

⑮ CASE-VEGETABLE

⑯ HOME-BAR

6. Freezing Cycle & Cold Air Circulation Course in Refrigerator

6-1) Freezing Cycle

COMPRESSOR → WIRE-COND → SIDE CLUSTER PIPE → HOT PIPE → DRYER
→ CAPILLARY TUBE → REFRIGERATOR EVAPORATOR → FREEZER EVAPORATOR
→ ACCUMULATOR → SUCTION PIPE → COMPRESSOR

REFRIGERATOR EVAPORATOR

SIDE CLUSTER PIPE

ACCUMULATOR

SUCTION PIPE

FREEZER
EVAPORATOR

COMPRESSOR

WIRE-CONDENSER

HOT-PIPE

CAPILLARY TUBE

DRYER

HOT-PIPE
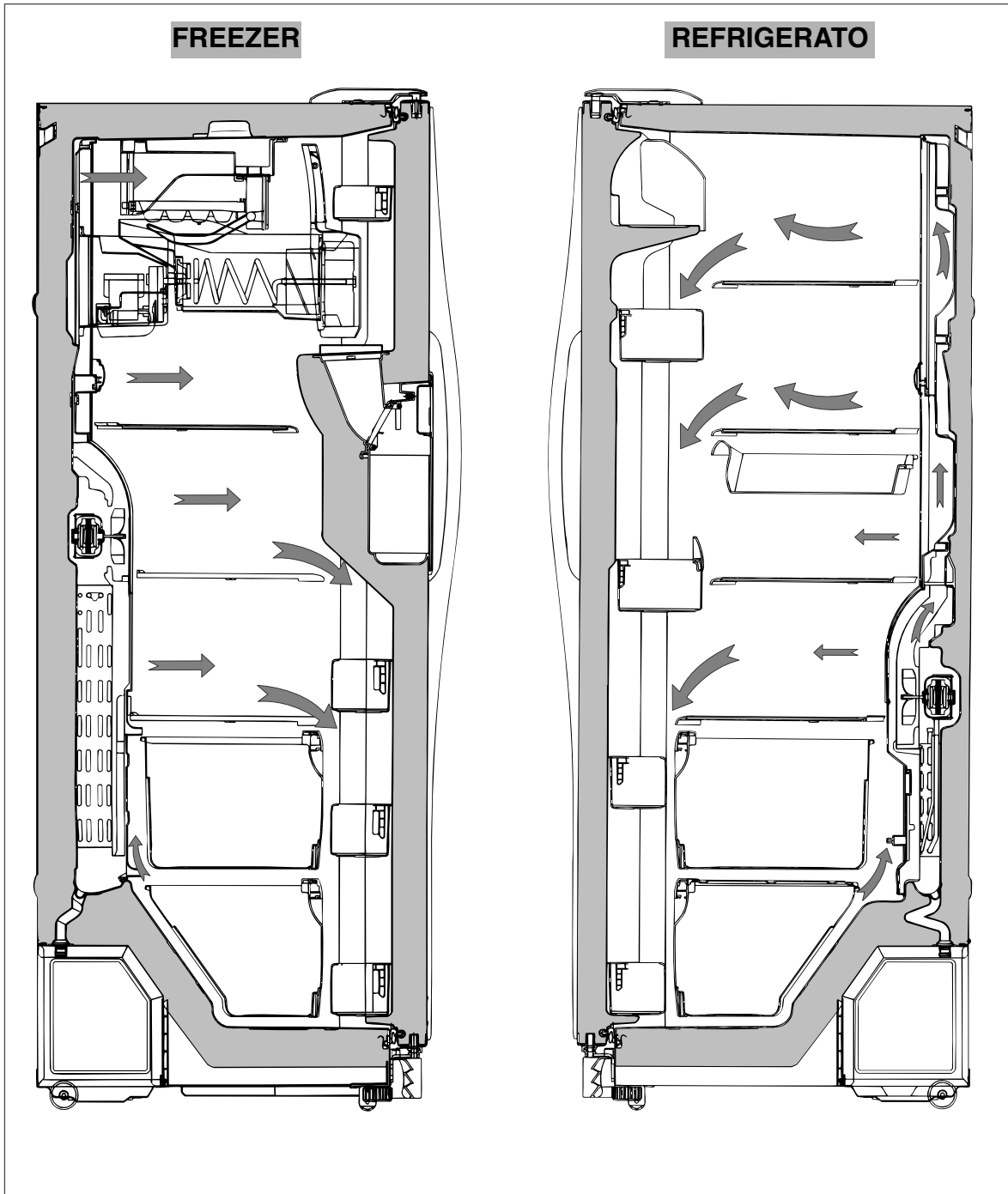
FREEZER

REFRIGERATO

7-2) Temperature Control Function

1) Basic and with Home Bar Models

FREEZER   REFRIGERATOR

QUICK FREEZE   -88℃   88℃   VACATION

FUZZY   LOCK

I N T E R A C T I V E   D I S P L A Y
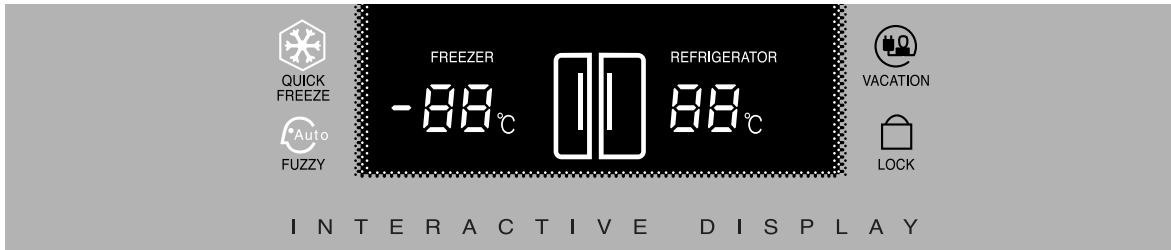
2) Dispenser and with Home Bar Models

FREEZER   REFRIGERATOR

QUICK FREEZE   -88℃   88℃   VACATION

ICE TIMER   LOCK

CUBED   CRUSHED   ICE OFF   WATER FILTER INDICATOR
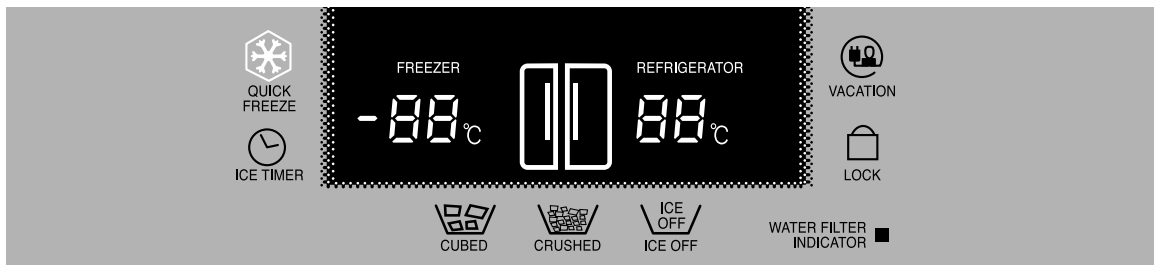
7-2) Temperature Control Function

① Temperature selecting function of freezer
   1) At initial Power On, -20˚C is selected automatically.
   2) Select one button for 13 levels of -14˚C ～-26˚C.
   3) 1˚C drops per each pressing of temperature selection button of freezer.

Division	At Initial Power On	One Time Press	...	6 Times Press	7 TimesPress	...	12 TimesPress
Display Change	-20˚C	-21˚C		-26˚C	-14˚C		-19˚C

② Temperature selecting function of Refrigerator
   1) At initial Power On, 3˚C is selected automatically.
   2) Select one button for 9 levels of 7˚C ～-1˚C.
   3) 1˚C drops per each pressing of temperature selection button of Refrigerator.

Division	At Initial Power On	One Time Press	...	4 Times Press	5 TimesPress	...	8 TimesPress
Display Change	3˚C	2˚C		-1˚C	7˚C		4˚C

＊ Reference (terms explanation)
   1)F Room: freezer 2) R Room: Refrigerator 3) F-FAN: fan motor in freezer 4) R-FAN: fan motor in Refrigerator 5) COMP: compressor

❋ Reference
Temperature of table on previous page is temperature of center part of 1/3 height of Refrigerator/Freezer compartments. It is temperature data at unload state. When actually used, temperature may differ according to surrounding condition and use frequency. The table displays general characteristic of temperature.

7-3) Function of Quick Freeze & Vacation

● Select extra Quick Freeze & Vacation button.

● Whenever Quick Freeze & Vacation button is pressed, selection/ cancellation (corresponding lamp On/Off) is repeated.

● When Quick Freeze & Vacation is selected, temperature setup of freezer and Refrigerator does not change.

● At state of selecting Quick Freeze & Vacation, change of temperature setup of freezer and Refrigerator is possible.

① Quick Freeze Function

  1) When Quick Freeze function is selected, COMP and F-FAN operates continuously for 2 and half hours.

  2) While Quick Freeze function is working, Refrigerator operates under present setup condition.

  3) When Quick Freeze function is completed (after continuous operation of COMP, F-FAN for 2 and half hours), Quick Freeze lamp lights out automatically and operates according to setup temperature of freezer.

② Vacation Function

  1) When Vacation is selected, Refrigerator fan is turned off.

  2) Though Vacation function is selected, Refrigerator fan does not turned off but turned on for initial 5 minutes.

  3) When Vacation function is selected and Ice Timer is set, Vacation function completes automatically when Ice Maker works by Ice Timer function. Then Refrigerator fan operates according to temperature setup of Refrigerator. (explained in detail at Ice Timer function)

  4) Vacation function is selected/ canceled by Vacation button. It can be canceled by temperature control button of Refrigerator while Vacation function is selected.

  5) While Vacation function is working, Vacation lamp is ON, and temperature display of Refrigerator is OFF.

❋ Reference
If Quick Freeze function is selected when freezer temperature is over -10°C and Refrigerator temperature is over +10°C like the condition of initial Power ON, Refrigerator Fan becomes OFF until freezer temperature drops under certain temperature. When freezer temperature becomes under certain temperature, Refrigerator Fan operates.

7-4) Alarm Function

① Button Touch Sound ("Ding-Dong" Sound)
   1) Input confirmation sound of "Ding-Dong" sounds when each button of
      Control Panel is pressed.
   2) "Ding-Dong" doesn't sound if more than two keys are pressed at the
      same time or buttons are wrongly operated.

② Door-Open Alarm Sound ("Ding-Dong" Sound)
   1) If door of freezer or Refrigerator remains open over 2 minutes, alarm
      sounds ten times.
   2) If door remains open continually afterward, alarm repeats ten times per one minute
      cycle.
   3) Alarm stops immediately when door of freezer or Refrigerator is closed.

③ Forced Operation & Forced Defrost Alarm Sound ("Beep" Sound)
   1) If forced operation or forced defrost is selected, "Beep" sound occurs.
   2) If forced operation is selected, alarm sound occurs until automatic
      cancellation (after 24 hour's forced operation) or cancellation function is
      selected.
   3) Also in case of forced defrost, alarm sound occurs until defrost is
      completed (including pause) or cancellation function is selected.

7-5) Defrost Function

① At time of initial Power On, defrost function works for both freezer and Refrigerator at
   the same time, when integrating time of Comp On is over 4 hours.
② Afterward defrost cycle is changeable according to use condition or surrounding
   environment from 6 hrs. to 38 hrs..
③ After completing the initial defrost, PRE-COOL function works for 20 min. to minimize
   temperature increase by defrost work. However, PRE-COOL function is determined
   according to temperature in Refrigerator at the point of defrost time.
④ If F-room temperature is over -21°C, PRE-COOL function works for F-room. If F room
   temperature is below -21°C, PRE-COOL function does not work.

7-6) Test Function

● Test function is for test, process inspection and SVC of PCB and product.
● After selecting test S/W and confirming function of product, turn on power switch
   again to operate self-inspection function.
● If you press Quick Freezer Key on Display Panel and temperature control Key in
   R-room for more than 8 seconds, all Displays will be turned off and continue operating
   in Test Mode. At this moment, if any key is pressed among freezer temperature
   control key, Refrigerator temperature control key, quick freeze key or vacation key, it
   operates as the test button.
   ✽ F-room : Freezer, R room : Refrigerator

① Forced Operating Function
   1) In the state where display panel was converted into test mode, if test button
      is selected once, COMP will operate immediately without 5 minute
      delay function. Therefore, forced operation is conducted at the very moment
      of COMP OFF, over load may be caused. Please be careful.
   2) If forced operation is selected, freezer and Refrigerator is set to automatic,
      and the temperature of freezer is set to "-26°C" and Refrigerator is set to
      "1°C", Comp and F-fan operates continuously, and R-fan in Refrigerator is
      controlled by "1°C" setup.
   3) Forced operation is valid for 24hrs. That is, if 24hours. pass after
      selecting forced operation, simultaneous defrost in both Refrigerator and
      freezer is automatically carried out. And normal operation is carried out
      by present setup of Refrigerator and freezer.
   4) Cancellation of forced operation in the middle of working is possible by
      turning on Power after turning it off (resetting), or by selecting test cancel
      mode shown in the item 3 below.
   5) When forced operation works, alarm sound will continue until forced
      operation is completed. There is no alarm cancel function.

② Forced Defrost Function
   1) In the state of forced operation, if display panel is converted into test mode and
      press the test button once more, forced operation is cancelled immediately,
      and evaporator defrost function of Refrigerator operates.
   2) At this time, beep alarm sounds for 3sec. at the point of defrost, and
      0.75sec. ON/0.25sec. off sound occurs during forced defrost function
      of Refrigerator works.
   3) If above defrost function of Refrigerator is maintained, it operates normally
      after defrost is completed.
   4) While forced defrost function of Refrigerator operates, pressing the test
      button once more enables simultaneous defrost for both freezer and
      Refrigerator.
   5) At this time, beep alarm also sounds for 3sec. at the point of defrost, and
      0.75sec. ON/ 0.25sec. off sound occurs continually until simultaneous
      defrost of F and R is completed.

③ Test Cancel Mode
   1) In the state of simultaneous defrost of freezer and Refrigerator, if display panel
      is converted into test mode, and test button is pressed once more, defrost
      of both freezer and Refrigeration is cancelled immediately and resumes
      normal operation .

   ✽ Reference
      It works step by step in test function. It does not change from 1 step
      (forced operation) to 4 step (test cancel mode) directly. It operates
      corresponding function only after it goes through the previous step. While
      test function works, it is most desirable to turn off main power and then turn it on.

① Self-diagnosis Function at the time of initial power is on.
   1) When the initial power is applied to Refrigerator, all lamps light and conduct self-diagnosis function internally.
   2) If result shows no fault, display will go into the initial normal lighting state.
   3) If result shows any fault, corresponding led is turned on and off and alarm sounds.
   4) Error sign of self-diagnosis continues until all defects of parts are repaired or self-checkup function is cancelled.
   5) If all corresponding parts are repaired completely, display will go into the normal mode state.
   6) After repairing Refrigerator, turn on switch again after turning it off to make it sure if Refrigerator is properly repaired.
   7) Therefore, in case open & short related problem of sensor needs to be confirmed during A/S, turn off the power of Refrigerator and turned it on again to operate self-Diagnosis function. Then sensor function can be checked.
   8) When any defect occurs, corresponding display signs are shown as in the following chart.

NO	Items	Corresponding LED	Defect Content	Remark
01	ICE-MAKER SENSOR	REFRIGERATOR	Defect of wire connecting system due to badness of Open/Short related aspect of Sensor which is equipped at the beneath of ice-making bowl	When temperature sensing of R-sensor is more than +50°C and less than -50°C.
02	Refrigerator R-sensor	REFRIGERATOR	Missing sensor housing of R-room, contact defects, disconnection of wires, defect of short-circuit sensor itself, etc.	Defect is indicated when temperature sensing of R-sensor is more than +50°C and less than -50°C.
03	Refrigerator defrost sensor	REFRIGERATOR	Missing sensor housing of R-room, contact defects, disconnection of wires, defect of short-circuit sensor itself, etc.	Defect is indicated when temperature sensing of R-sensor is more than +50°C and less than -50°C
04	R-fan motor Error	REFRIGERATOR	Interference of Fan due to frost, etc., un-insertion of connector, disconnection, etc.	Occurrence of the case where Fan Motor of inner refrigerator room becomes to operate under about 600rpm at the normal operation condition or stops driving.
05	ICE-MAKER KIT	REFRIGERATOR	Defect of micro S/W in Gear box, motor, gear and other defect in wire system	When normal operation is not done until ice-isolating motion is attempted 3 times (only ice-making function model corresponds).
06	Outside Air Sensor	FREEZER	Missing of outside air sensor housing inside of PCB base of top part of Refrigerator, contact defect, disconnection of wires, defect of short-circuit sensor itself, etc.	Badness is indicated when temperature sensing of Outside Air Sensor is more than +50°C and less than -50°C.
07	Freezer F-sensor	FREEZER	Missing sensor housing in F-room, contact defects, disconnection of wires, defect of short-circuit sensor itself, etc.	Defect is indicated when temperature sensing of F-sensor is more than +50°C and less than -50°C.
08	Freezer defrost-sensor	FREEZER	Missing defrost-sensor housing in evaporator of F-room, contact defects, disconnection of wires, defect of short-circuit sensor itself, etc	Defect is indicated when temperature sensing of F-sensor is more than +50°C and less than -50°C.
09	F-fan motor Error	FREEZER	Interference of Fan due to frost, etc., un-insertion of connector, disconnection, etc.	Occurrence of the case where Fan Motor of inner freezer room becomes to operate under about 600rpm at the normal operation condition or stops driving.
10	C-fan motor Error	FREEZER	Un-insertion of connector, disconnection, etc.	Occurrence of the case where Comp Cooling Fan Motor becomes to operate under about 600rpm at the normal operation condition or stops driving.

Note) This self-Diagnosis works only when the open/short related aspect of sensor is bad. Minute feature change of sensor is not judged as defect if it does not get rid of the extent of temperature sensor described in Remark so that it is indicated as normal.

② Self-Diagnosis Function in Normal Operation

    1) Under normal operation of Refrigerator, if you press "Quick freeze" and "Vacation" button at the same time for 6sec., temperature setup display will proceed On/Off blink of all for 2sec. at 0.5sec. interval.
    If you press "Quick freeze" and "Vacation" button continuously at the same time for about 8sec. including 2sec. of repetition of LED's On/Off, self-Diagnosis function is selected.

    2) At this moment, it goes into self-Diagnosis function with "Ding-dong" buzzer sound.

    3) When Error occurs, it is restored to normal state regardless of defect repairing after signal lasts for 30sec. ("Ding-dong" buzzer sound).

    4) While it is operating self-Diagnosis function, it does not accept input of button.

7-8) Load Condition Indicating Function

① In normal operation, if you press "Quick freeze" and "Vacation" button at the same time for 6 sec., all setup display of freezer and Refrigerator are turned on. If you hand off from the button at this moment, temperature setup display of freezer and Refrigerator will proceed On/Off blink of all for 2sec. at 0.5sec. interval. While On/Off blink is processing, if you press the temperature setup button, it goes into load condition indicating function (with ding-dong buzzer sound).

② Load condition indicating mode shows from which load Micom signal outputs at present. However, it only shows that micom signal is outputted and does not confirm whether load is actually operating or not. That is, even if load is displayed as it is operating, load may not operate because of actual defect of load or defect of relay on PCB. During A/S, you can use this function by applying the main function.

③ Time required to indicate is 30 sec.. After 30sec., it is automatically restored to the setup state before its function.

④ Corresponding display indication about load condition is shown as in the following table.

✻ Load Mode Check List

NO	Display Content	Operation Content
①	R-fan high	R-fan high speed operation indication
②	R-fan low	R-fan low speed operation indication
③	R-Def-Heater	R room defrost-heater operation indication
④	Start Mode	indication operation stage (Not important)
⑤	Overload Mode	when ambient temperature is more than 34°C
⑥	Low-temperature Mode	when ambient temperature is less than 17°C
⑦	Comp	Comp operation indication
⑧	F-fan high	F-fan high-speed operation indication
⑨	F-fan low	F-fan low-speed operation indication
⑩	F-Def-Heater	F room defrost-heater operation indication
⑪	C-fan high	C-fan high-speed rotation operation indication
⑫	C-fan low	C-fan low-speed rotation operation indication

Press both buttons 6 sec, simultaneously, all LED lights are turned on and off twice.
At this time press button ⓐ.
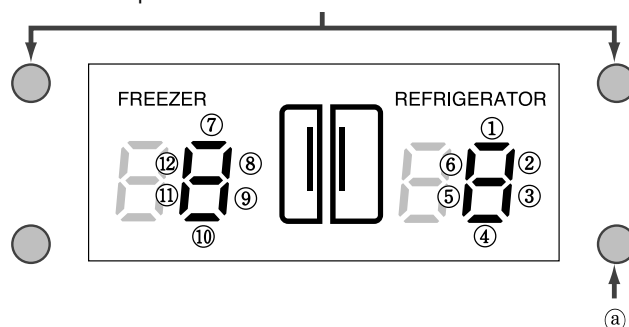
✻ For load under operation, corresponding LED lights on.

7-9) Function of Ice/Water Dispenser when they are equipped.

● This function only applies to a model equipped with ice-maker.
● This function is limited to a model from which ice and water can be taken out
  from outside without opening door.

① Cube Ice / Crushed Ice/ Stop (Off) Function
  1) At the time of intial power on, when inside temperature of freezer is more than 5°C,
     Cube Ice LED light on display is lit on, and Crushed Ice LED light keeps light-off
     state. But when power is turned on, if inside temperature of freezer is less than 5°C,
     Micom recalls form of ice which was set up before power off so that it displays the
     memorized ice form.
  2) "Cube" → "Crushed" → "Ice Off" is selected in turn by ice selecting Key.
  3) In case of selecting "Crushed" mode, it operates Gear Motor to eject crushed ice
     to outside when ice lever operates as ice is made in the bowl of ice machine.
  4) In case of selecting "Cube" mode, Gear Motor and ice solenoid operate to eject
     cube ice to the outside when ice lever operates as ice is made in the vessel of
     ice machine.
  5) If "Ice Off" is selected, it stops only ice-making function of   ice-maker so
     that ice is not made.
◆ At the moment of selecting "Ice Off", ice-making function stops. But, if it is in
   the process of ice-isolating, returning to horizontal state and supplying
   water, it maintains stoppage state after water supply is completed.
◆ Even when "Ice-Off" function is operating, ice eject lever operates normally.
   This is not a defect. Therefore, remained ice in the ice container can be used
   normally.

② Ice Timer Function
  1) If you press ice timer button, it is automatically set to Ice-Off mode regardless of
     present setup condition of ice mode (Cube / Crushed / Ice Off), and ice lamp is
     turned on. And time is set to 3 days on temperature control display of freezer at first.
     And each time you press the ice button, the number increases one by one. And if it
     reaches 30 days, it resumes from 3 days.
  2) Among ice timer functions, if you press ice selecting key, ice timer function
     is cancelled.
  3) If reservation is made by ice timer button, setup temperature of freezer returns to
     temperature display of freezer after 5sec.. At this moment, if ice timer button is
     pressed again, it displays the previous reserved date again.1-2 days before the
     reserved date is completed, ice maker starts operating. And when the reserved date
     is completed, more than half of ice bucket is filled. <None>
  4) If ice timer is reserved and vacation function operates, vacation function
     ends at the same time when ice timer function ends.

5) The following are examples for use.
◆ In case of selecting vacation function only
  If you press "vacation" button, Refrigerator will not operate and freezer will operate
  only. In case you select this function, take out all foods in the Refrigerator. And "Ice
  Off" is automatically selected among ice modes, so ice bucket should be empty and
  water supply valve should be turned off.
◆ In case of selecting ice timer function only
  In case you press "Ice Timer" button to select date as explained above, and not
  selecting "Vacation" function so that Refrigerator continues to operate, ice mode is
  selected as "Ice Off" and ice is stored in the bucket when you return. Therefore, do
  not lock the water supply valve.
◆ In case of selecting both vacation and ice timer function
  In case you press "Ice Timer" button and "Ice Timer" button to select date to select
  date as explained above, or if you press "Ice Timer" button to select date and press
  "Vacation" button afterward, Refrigerator does not operate but freezer operates only,
  and ice mode is automatically selected as "Ice Off". So you must take out all foods in
  Refrigerator, empty ice in the ice bucket, check water leakage on valves, other hoses
  and connection parts without locking water supply valve. When "Vacation" function is
  cancelled, Refrigerator resumes its operation.

③ Ice Dispenser Function (Cover Ice Route Solenoid Valve)
  1) After 8sec. from initial power on, solenoid of ice exit operates once. This is the
     function to prevent interruption of electric service when ice exit is open. So this is not
     a defect.
  2) With turning the dispenser S/W from on to off and ice ejecting is
     completed, 5sec. after turning off S/W, ice exit is closed because cover ice
     route solenoid of ice dispenser operates.

④ Water Dispenser Function
  1) This function is a system of direct connection with water supply. When water lever is
     pressed, water solenoid valve which is equipped at the right side of machine room
     opens so as to operate to eject water. However, it has no function to control on
     Micom PCB. Therefore, if there happens any defect at water eject function, check
     and repair solenoid itself, wire connecting connector, connecting tube and state of
     water supply.

⑤ Water Filter Indicator Function
  1) After the initial power on, indication lamp is displayed in green light. After 5 months
     passed, it is displayed in orange light, and 1 month after this, it is displayed in red
     light. This is memorized by EEPROM in Micom PCB, so it counts the passed time
     continually though the power is turned on again after it was turned off.
  2) If you press ice selecting button and ice-making stop button at the same time for
     25sec. continuously, indication lamp lights in green color. And it becomes orange
     after 5 months from this moment. And it displays red after 1 month from the
     moment.
  3) If you press ice selecting button and ice-making stop button at the same time for 5
     sec., indication lamp is turned off and water filter indicator function stops. At this
     moment, passed time is not counted.
  4) At the state where the function is stopped, if you press ice selecting button and ice-
     making stop button at the same time for 25sec. continuously, "Green"light is turned
     on and water filter indicator function will resume. And it becomes orange light after 5
     months from this moment. And it displays red light after 1 month from the moment.

7-10) Restoring Function of Operation State in case of Power Stoppage

1) In case power is applied to prevent customer from nonsense call about initialization of freezer and Refrigerator at -20˚C and 3˚C respectively when a momentary power stoppage (not a long-term power stoppage) occurs while Refrigerator is operating, it operates in two ways. The first one is initialization by judging the temperature of inside of freezer, and the second one is restoration of operation state.

2) At the initial power on, in case temperature of the inside of freezer is judged as about less than +5˚C, it is regarded as momentary power stoppage during operation. Therefore, functions related with panel display such as Quick Freeze, Vacation, Freezer setup, Refrigerator setup, Ice timer, Form of ice, etc. are restored.

3) At the initial power on, in case temperature of the inside of freezer is about more than +5˚C, it is regarded as long-term power stoppage. In this case, panel display is initialized (Quick off, Vacation off, Freezer is set to -20˚C, Refrigerator is set to 3˚C, Ice timer off, Cube selecting).

4) Ice timer function and water filter indication function are not initialized in case of power stoppage. But during power stoppage, time count does not progress because Micom in PCB does not operate because power source is not supplied.

8. Operation Principle of Circuit

8-1) Power Source Part

SMPS
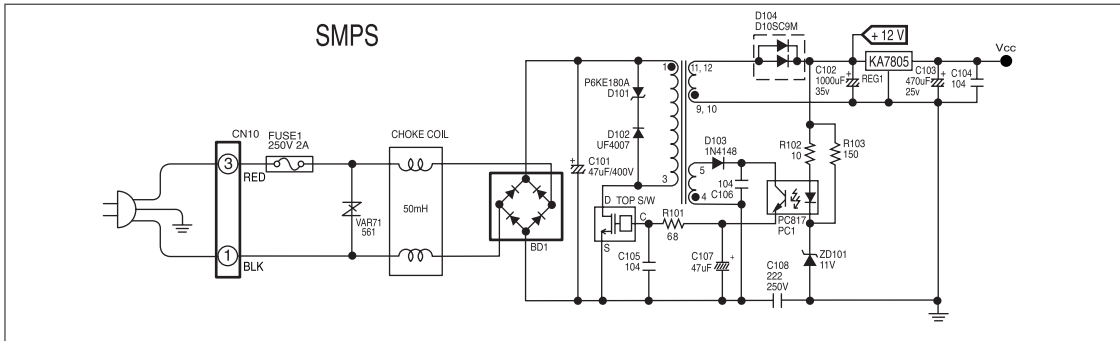
When power is supplied, electric wave is rectified through BD1 to generate voltage of about DC 300V.Top S/W is automatically switched to the optimum condition according to load condition of the second part.
When electricity flows between D and S of the top S/W, electricity is generated inside the trans, and when the power between D and S is turned off, electricity which is deserted at trans is transmitted to the second part.
This process is repeated to maintain the fixed voltage of 12V by C102 of the second part. This power supplies electricity to power source of 5V, relay and display, and it allows operation of main PCB possible.

8-2) Oscillation Circuit Part

Terminal	Oscillation Frequency
Xin(#30)	4MHz
Xout(#31)	4MHz
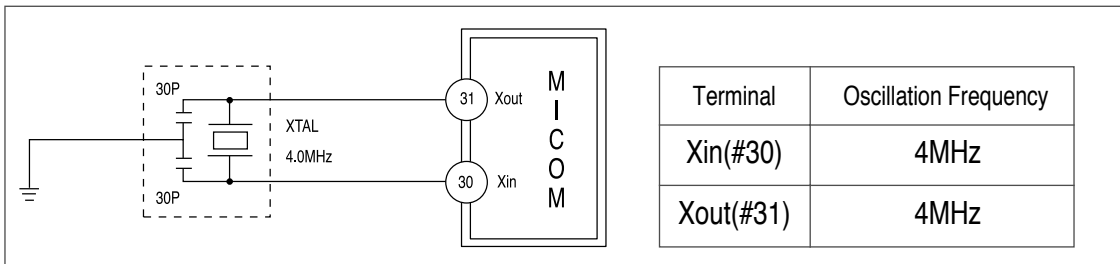
It is oscillation circuit for synchronism clock generation and time calculation on information sending/receiving of internal elements. It does not carry out its normal function because timing system of MICOM alters in case the specification of resonator changes.

8-3) Reset Circuit Part

Terminal	Voltage
Vcc	DC 5V
RESET	DC 5V
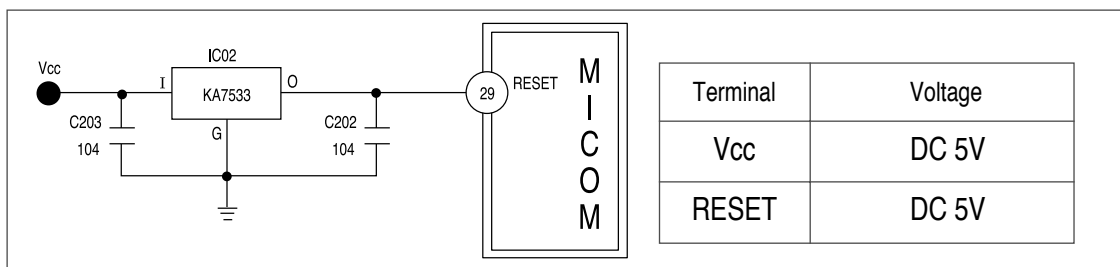
Reset circuit is a circuit which allows the whole program operate on an initial position by initializing several parts such as RAM inside of MICOM when power is applied to MICOM. When power is supplied, the reset terminal voltage becomes several tens μs"LOW" state compared with Vcc voltage (DC 5V) of MICOM, and it maintains "HIGH"(Vcc voltage) state in normal operation condition.

8-4) Door S/W Sensing Circuit

Terminal	Voltage	MICOM
F-Room	DOOR CLOSE	5V (HIGH)
	DOOR OPEN	0V (LOW)
R-Room	DOOR CLOSE	0V (LOW)
	DOOR OPEN	5V (HIGH)
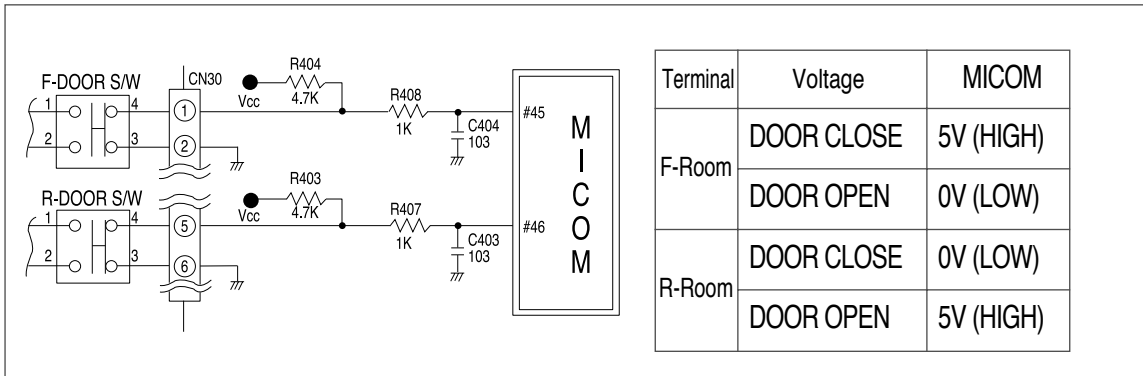
For door open sensing of F room, ② of CN30 is connected to the ground. For ①, Vcc(DC 5V) is supplied through resistance R404(4.7㏀), and "LOW"(0V)/"HIGH(5V)" is applied to MICOM by open/close of the F room door so that it can sense open/close of the F room door. For door open sensing of R room, ⑥ of CN30 is connected to the ground. For ⑤, Vcc(DC 5V) is supplied through resistance R403(4.7㏀), and "LOW"(0V)/"HIGH(5V)" is applied to MICOM by open/close of the R room door so that it can sense open/close of the R room door. At this time, if there is any defect at the door S/W, the corresponding fan inside the Refrigerator does not work or alarming function works. Therefore, the door S/W must be checked in case of A/S. That is, if door opens, the corresponding fan inside the Refrigerator stops without fail. When connection point of S/W has defect, MICOM judges that door is open so that it stops the fan though the door is closed.

8-5) Temperature Sensing Circuit Part

MICOM terminal	Voltage
PIN #56 (F-SENSOR)	MICOM terminal voltage changes in accordance with temperature.
PIN #57 (F-DEF-SENSOR)	
PIN #58 (R-SENSOR)	
PIN #59 (R-DEF-SENSOR)	
PIN #60 (EXT-SENSOR)	
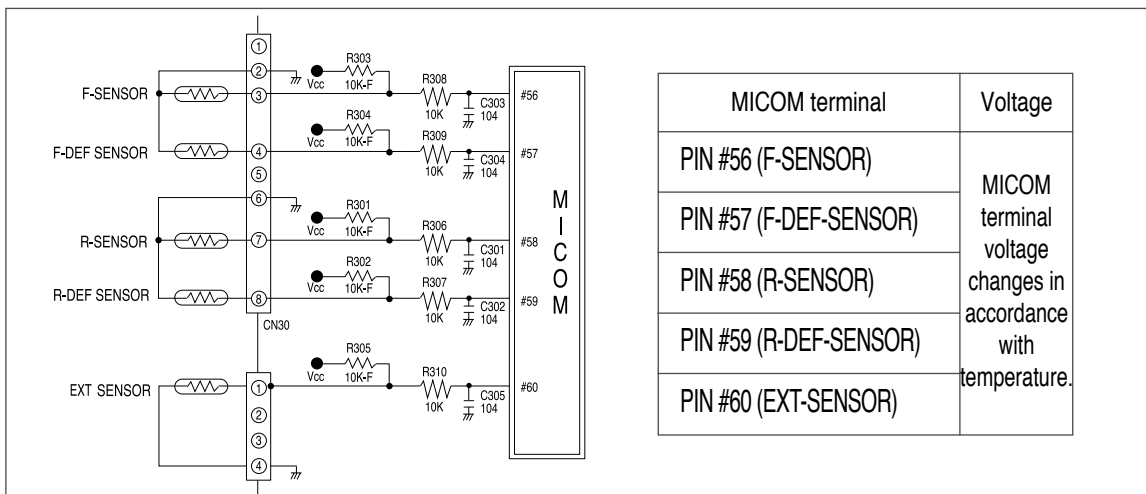
Sensor uses thermistor which has temperature coefficient of negative resistance. When temperature rises, resistance value gets smaller, and when temperature falls, resistance value gets larger. R306~R310, C301~C305 are parts for noise prevention, which are not related to temperature sensing characteristic. In case of F-SENSOR, if setup voltage inputted to MICOM Referred to as Vf, Vf= (Rth*Vcc)/(R303+Rth). Here, Rth is resistance value of thermistor corresponding to temperature. See conversion table of "Refer 6" of this manual on resistance and voltage of sensor about temperature for Reference. As terminal voltage of MICOM corresponding to temperature is also designated, Refer to it at A/S time.
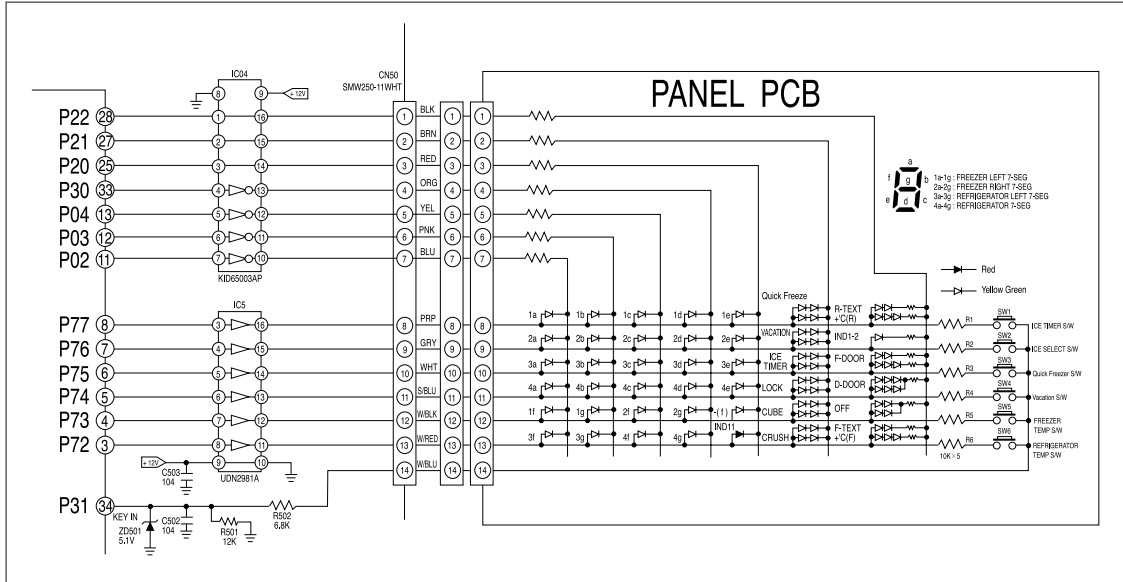
① Key Scan and Display Operation

As is seen on each wave form of the following, send "HIGH" output in an order of MICOM PIN NO #3→#4→#5→#6→#7→#8 for 2msec in a cycle of 12msec using six terminals of MICOM NO #3, 4, 5, 6, 7, 8. This signal appears onto output terminal through input terminal of IC05(UDN2981 or KID65783AP). At this time, peak-to-peak voltage of the spherical wave is about 11V(DC RMS1.5), and form of output wave form is like the drawing 1.
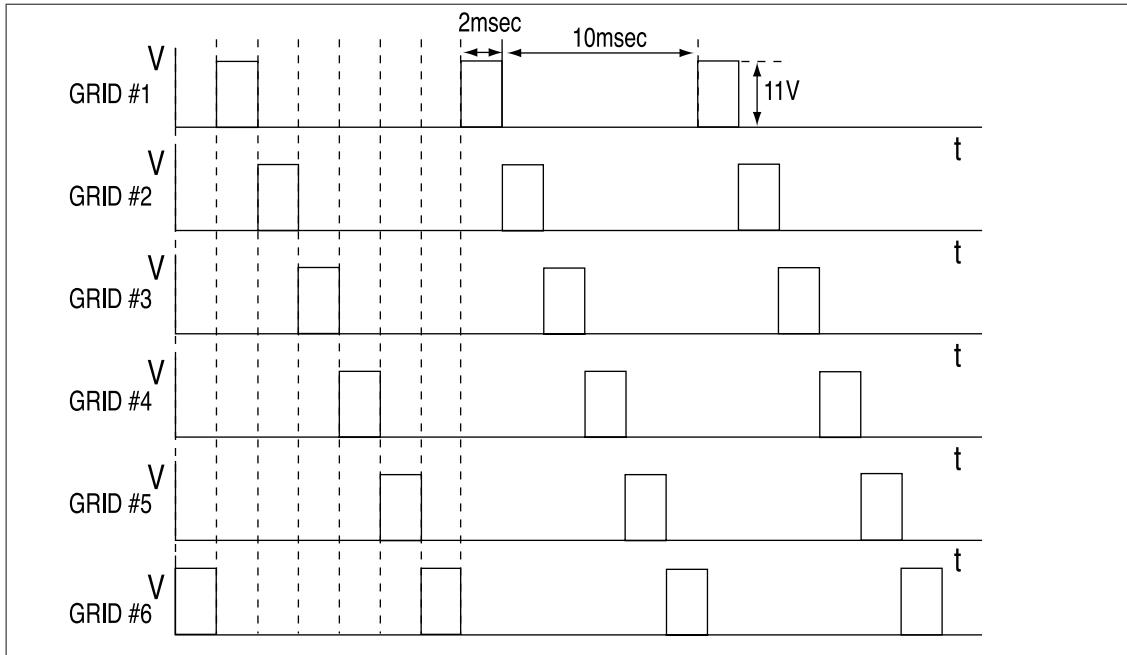
② Key Scan

When the wave form of GRID#2 is outputted, this signal is provided to SW6 button through the resistance of 10 ㏀. When SW6 is pressed at this time, signal gets smaller by R501(12 ㏀), and about 4.5V of peak-to-peak voltage is applied to MICOM. MICOM judges that the wave form of GRID#1 is inputted, and changes function corresponding to SW6 KEY. In this way, each wave form of GRID is recognized.
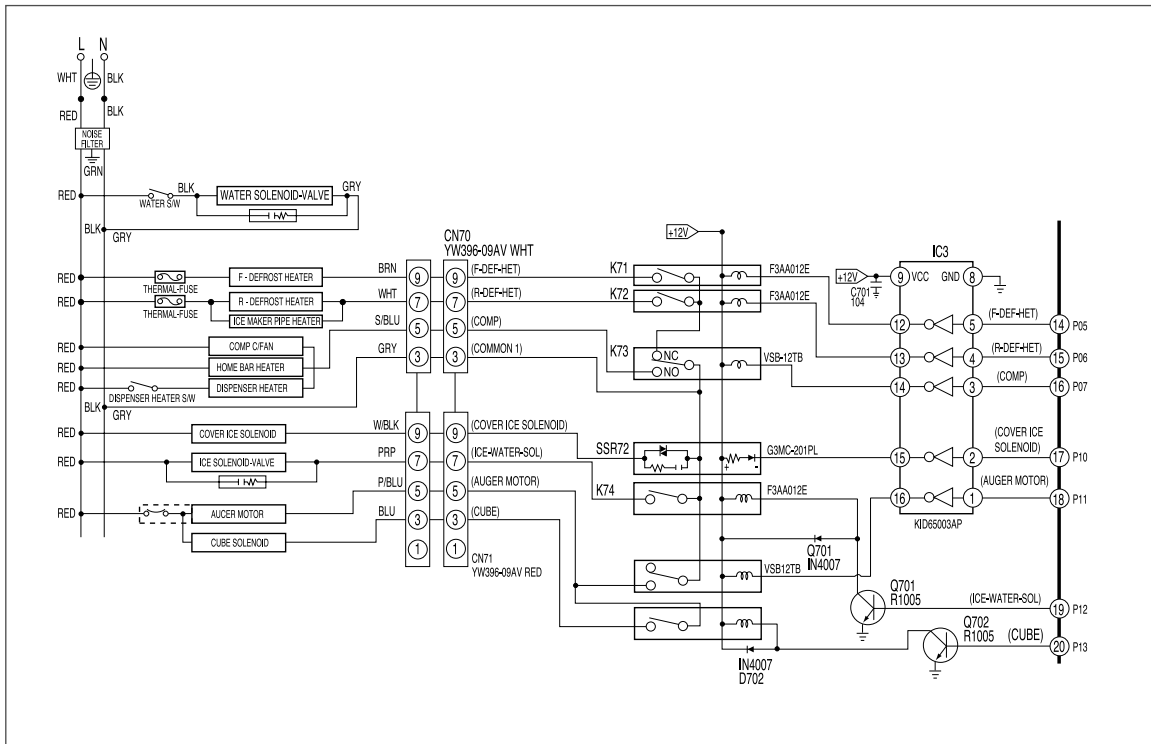
When "HIGH" signal is applied to INPUT terminal of IC03(KID65003AP) from MICOM PIN NO #16(P07), IC is turned on. At this time, V12(DC12V) which is applied to the one terminal of coil of COMP relay flows to ground through output of IC03. Then core generates magnetic field to turn on the connection point, and it applies voltage of 230V to COMP load to turn on COMP. When MICOM PIN NO #16 changes to "LOW" state, electricity cannot flow to COMP relay coil because IC is turned off. So relay connection point becomes to OFF state and stops COMP.

① COMP & F,R Defrost Heater Inter-operation Explanation
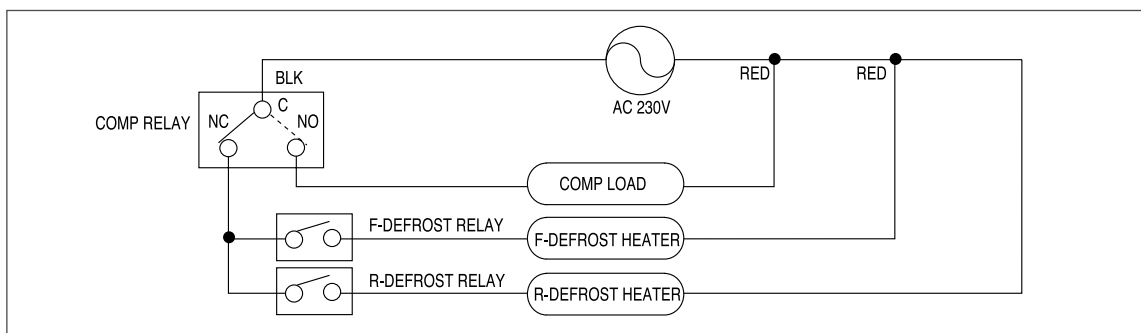
Like the above block diagram, operation of F, R defrost heater is determined according to the operation of relay for COMP. When COMP relay is connected to NO terminal, COMP operates. However, in case of F, R defrost heater, electricity does not pass through the heater though relay works. But, if COMP relay is connected to MC terminal, COMP does not operate and heater gets electricity according to operation of F, R defrost relay.

❋ Purpose of application of above circuit: It aims to interrupt electricity passage through F, R defrost heater even though F, R defrost relay is bad while COMP is operating.

8-8) BLDC Motor Operation Circuit Part
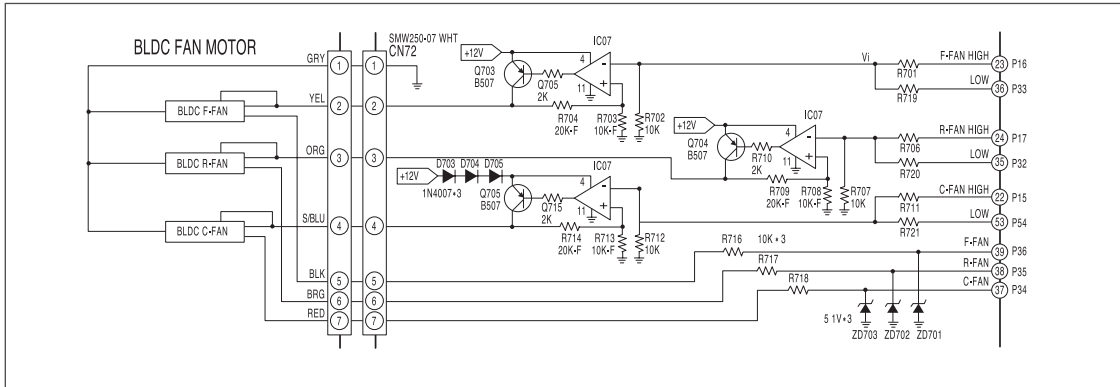
■ In case Fan Motor is locked, therefore, when Fan Motor is constrained to less than about 600rpm in order to prevent over-current to the power source group, PIN #39, #38 and #37 sense it so that they can stop Fan Motor operation.

If Fan Motor operation is stopped by this function, it becomes to re-operate every 10 second. If Motor Connector is separated under the state where the power source is applied during service, Micom recognizes it as Fan Motor is constrained so that Micom can stop Motor. Then Motor resumes to operate after 10 seconds.

However, there are a part of products which re-operate every about 5 minute among the products which were manufactured in February and March.

Therefore, when the product is completely repaired, confirm the repaired state with power-ON again after power-OFF if possible.

8-9) Various Option Function

■ When pressing the temperature control s/w of freezer and vacation s/w for 12 sec. continuously at the same time, display is converted into option setup mode.

■ When display is converted into option setup mode, every display except for temperature display of freezer and Refrigerator turns off like the following.
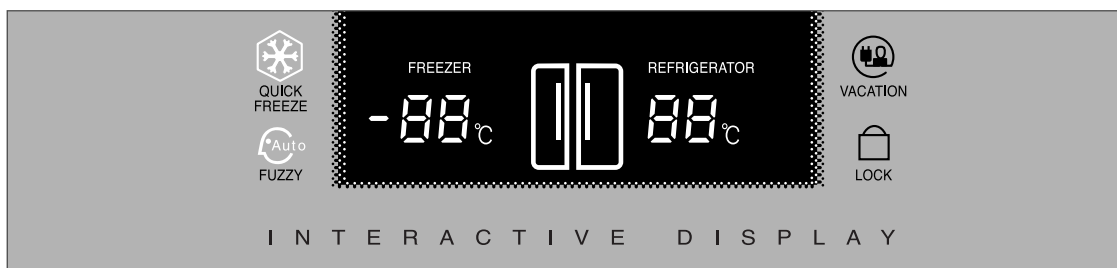
■ On display like the above, temperature display of Refrigerator indicates items of option, and temperature display of freezer indicates setup value for each item.For the temperature display of Refrigerator, when temperature control s/w is pressed, option items increase, and when vacation s/w is pressed, option items decrease. For the temperature display of freezer, when temperature control s/w is pressed, option setup value increases, and when vacation s/w is pressed, option setup value decreases. If waiting for 20sec. after changing option by controlling s/w, option setup value is saved to EEPROM, and option setup mode is canceled automatically and restored normal display. For example, if you want to shift temperature of Refrigerator by -3˚C by controlling option, follow the processes of below.

1) Press temperature control s/w and vacation s/w of freezer for more than 12 sec. simultaneously : all displays become off except temperature display of freezer and Refrigerator.

2) Pressing temperature control s/w of Refrigerator for one time, "1" is indicated on Refrigerator display : If indication "1" is displayed on Refrigerator display, it shows temperature setup of Refrigerator, and current temperature setup value of Refrigerator is indicated on temperature display of freezer.

3) If temperature display of freezer indicates "9" this time, check value which is set at present from the table in the next page. In this case, you can see that temperature is changed to +1.0˚C compared to the standard temperature according to the table : Here, in order to change by -3.0˚C, (+1.0˚C) + (-3˚C) = -2.0˚C is calculated.

4) Now Refer to the table on the next page to change temperature to -2˚C. Press temperature s/w and quick freeze s/w of freezer for temperature control display to indicate "4": Waiting for 20sec. after setup, MICOM saves setup value to EEPROM and returns to the normal display and cancel option setup mode.

❋Caution
When product is delivered, option function is set to EEPROM from the plant, therefore, Refrain from intentional change except for special case. Option function setup is completed only after it is returned to the normal display after 20sec.. So do not turn power off before display returns to the normal state.

8-10) Option Related to Temperature

■ Freezer Temperature Change Table

Set item	Refrigerator display
Freezer temperature change mode	"0"

● Example

- When set to -2.5˚C, compared with the standard temperature of freezer

Temperature change	Freezer display	Temperature change	Freezer display
0	"0"	+ 0.5˚C	"8"
- 0.5˚C	"1"	+ 1.0˚C	"9"
- 1.0˚C	"2"	+ 1.5˚C	"10"
- 1.5˚C	"3"	+ 2.0˚C	"11"
- 2.0˚C	"4"	+ 2.5˚C	"12"
- 2.5˚C	"5"	+ 3.0˚C	"13"
- 3.0˚C	"6"	+ 3.5˚C	"14"
- 3.5˚C	"7"	+ 4.0˚C	"15"

■ Refrigerator Temperature Change Table(●: corresponding lamp is on, ●: corresponding lamp is off)

● Example

- When set to +2.5˚C, compared with the standard temperature of Refrigerator

Set item	Refrigerator display
Refrigerator temperature change mode	"1"

Temperature change	Freezer display	Temperature change	Freezer display
0	"0"	+ 0.5˚C	"8"
- 0.5˚C	"1"	+ 1.0˚C	"9"
- 1.0˚C	"2"	+ 1.5˚C	"10"
- 1.5˚C	"3"	+ 2.0˚C	"11"
- 2.0˚C	"4"	+ 2.5˚C	"12"
- 2.5˚C	"5"	+ 3.0˚C	"13"
- 3.0˚C	"6"	+ 3.5˚C	"14"
- 3.5˚C	"7"	+ 4.0˚C	"15"

8-11) Option Related with Ice Maker

■ Following options are applied only for models which are equipped with ice maker.

■ It is water supply time option that operates when the flow sensor for time control function of water-supply for ice maker is out of order (identical with DIP s/w of existent ZIPEL).

■ It is the temperature of ice making sensor which checks whether the ice of ice-maker of temperature change of ice making sensor freezes completely.

Set item	Refrigerator display
Ice maker water supply time	" 3 "

Water supply time	Freezer display
5sec	" 0 "
4sec	" 1 "
3sec	" 2 "
6sec	" 3 "
7sec	" 4 "
8sec	" 5 "
9sec	" 6 "
10sec	" 7 "
12sec	" 8 "
13sec	" 9 "
15sec	" 10 "
17sec	" 11 "
19sec	" 12 "
21sec	" 13 "
23sec	" 14 "
25sec	" 15 "

Set item	Refrigerator display
Ice making temperature	" 4 "

Temperature change	Freezer display
- 7˚C	" 0 "
- 6˚C	" 1 "
- 8˚C	" 2 "
- 9˚C	" 3 "
- 10˚C	" 4 "
- 11˚C	" 5 "
- 12˚C	" 6 "
- 13˚C	" 7 "

● Example
- When ice making sensor is set to -10˚C

● Example
- When water supply time is set to 9sec.
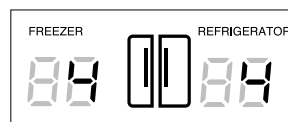
■ When Refrigerator temperature display indicates "2", the data indicated on the freezer temperature display is the function which is not used in this model so that additional adjustment is not necessary.

■ If Refrigerator temperature display is not selected more than "2" during option function is setting among models which are equipped with dispenser and ice-maker, replace the main PCB assembly.

Note: If Refrigerator temperature control s/w and vacation s/w are used, several other options except the above functions are set. However, those points are omitted because they are not necessary part at the A/S time as they are items related with Refrigerator control function (Do not set options other than the above A/S manual contents).

9. Trouble Diagnosis & Repair Method

1. Check whether power cord is normally connected before repairs.
2. Practice checkup on the basis of Reference in the next page.

9-1) When power is not supplied

```
                          ┌─────────────────┐
                          │      Start      │
                          └─────────────────┘
                                   │
                                   ▼
                          ╱ 230V AC FUSE ╲        Y
  *power cord terminal ···╲ Disconnection? ╱──────────────►  ┌──────────────┐
   connection                   │ N                          │ Replace FUSE │
                                 ▼                            └──────────────┘
                          ╱ Is power 230V ╲       N
                          ╲ applied to both ╱──────────────►  ┌──────────────────┐
                          ╱  terminals     ╲                  │ Check cord       │
                          ╲  of CM10?       ╱                 │ assembly         │
                                 │ Y                          │ connection.      │
                                 ▼                            └──────────────────┘
                          ╱ Is voltage about ╲    N
                          ╲ DC 320V applied to ╱────────────► ┌──────────────────┐
                          ╱ both BD1+terminals?╲              │ Replace PCB      │
                                 │ Y                          │ pattern and BD1. │
                                 ▼                            └──────────────────┘
  �֍ Caution               ╱ Is voltage DC5.8V ╲  N
  As high pressure current╲ applied between top ╱──────────► ┌──────────────────┐
  more than DC300Vgenerates╱ s/w 223Y 'C-S' ?  ╲             │ Replace PCB      │
  on the power part of main      │ Y                          │ assembly.        │
  PCB, take great care in        ▼                            └──────────────────┘
  case of checkup and      ╱ Is voltage 12V ╲     N
  measurement.            ╲ applied to both ╱──────────────► ┌────────────────────┐
                          ╱  terminals      ╲                │ Replace D104(D105) │
                          ╲  of C102?        ╱               │ (S3L20U)(D10SC9M)  │
                                 │ Y                         └────────────────────┘
                                 ▼
                          ╱ Is voltage 5V ╲      N
                          ╲ applied to both ╱─────────────►  ┌──────────────────┐
                          ╱  terminals      ╲                │ Replace REG1     │
                          ╲  of C103?        ╱               │ (7805).          │
                                 │ Y                         └──────────────────┘
                                 ▼
                          ╱ Does panel PCB ╲      N
  �֍lead wire cable, door ·╲ operate normally?╱────────────► ┌──────────────────────┐
   (connect at HINGE-UP          │ Y                         │ ① Check cord assembly│
    part)                        ▼                           │   and repair         │
                                                             │ ② Replace panel PCB  │
                          ╱ Does load of relay ╲  N          └──────────────────────┘
                          ╲ and so forth operate ╱─────────► ┌──────────────────────┐
                          ╱   normally?        ╲             │ ① Replace the        │
                                 │ Y                         │   corresponding relay│
                                 ▼                           │ ② Check connection of│
                          ┌──────────────┐                   │   lead wire          │
                          │    Normal    │                   └──────────────────────┘
                          └──────────────┘
```

Pre-checkup

1. When power is applied initially, COMP works after 3~6 sec.. However, when COMP turns off during its operation, COMP doesn't work for 5min..
2. COMP doesn't work during defrost
3. If freezer sensor is not connected, it is sensed as low temperature and COMP doesn't work.

9-2) When COMP doesn't work

```
                          ┌──────────────┐
                          │    Start     │
                          └──────┬───────┘
                                 │
                        ╱────────────────╲      N     ┌──────────────────┐
                       ╱ Passed 5min. after╲──────────▶│ Check after 5 min.│
                       ╲   COMP off?       ╱◀──────────└──────────────────┘
                        ╲────────────────╱      Y
                                 │ Y
                                 ▼
  Reference 7          ╱──────────────╲          Y              ┌──────────────────┐
  ·············       ╱  Does COMP     ╲───────────────────────▶│                  │
                     ╱  drive at forced ╲                       ▼
                     ╲   operation?     ╱              ╱──────────────╲      N    ┌──────────────────┐
(Does alarm sound     ╲──────────────╱    Reference 4 ╱ Is freezer sensor╲───────▶│ Repair open and  │
due to forced               │ N         ············╲   normal?       ╱         │ connection state │
operation?)                 ▼                        ╲──────────────╱           └──────────────────┘
                     ╱──────────────╲                       │ Y
                    ╱ Is MICOM #1601  ╲                      ▼
                    ╲ HIGH applied?(5V)╱            ╱──────────────╲      N    ┌──────────────────┐
                     ╲──────────────╱              ╱ Is temperature  ╲────────▶│ Repair sensing   │
           ┌──────────────┐  │ Y                   ╲ sensor of main   ╱         │ part and replace │
           │Replace MICOM │  │                      ╲ PCB is normal? ╱          │ PCB              │
           │ and PCB      │  ▼                       ╲──────────────╱           └──────────────────┘
           └──────────────┘ ╱──────────────╲                │ Y
                           ╱ Is IC03 #14 LOW ╲               ▼
                           ╲ applied?(0V)    ╱      ┌──────────────────┐
                            ╲──────────────╱        │ Control cord and │
           ┌──────────────┐  │ Y                    │ repair connection│
           │Replace IC03  │  │                       │ state           │
           │ and repair   │  ▼                       └──────────────────┘
           └──────────────┘ ╱──────────────╲
  Reference 2              ╱ Replace COMP relay╲    N    ┌──────────────────┐
  ···············         ╲   and repair     ╱─────────▶│ Replace COMP RELAY│
                           ╲──────────────╱            └──────────────────┘
                                 │ Y
                                 ▼
                         ╱──────────────╲
                        ╱ Is contact state╲    N    ┌──────────────────┐
                        ╲ of Connector CN70╱───────▶│ Complete insertion│
                        ╲ CN71 is normal? ╱         │ of Connector     │
                         ╲──────────────╱           └──────────────────┘
                                 │ Y
                                 ▼
                         ╱──────────────╲    N    ┌──────────────────┐
                        ╱ Is COMP assembly╲──────▶│ Replace COMP ASS'Y│
                        ╲   normal?       ╱       │ and repair        │
                         ╲──────────────╱        └──────────────────┘
                                 │ Y
                                 ▼
                    ┌───────────────────────────┐
                    │ Cord Assembly and         │
                    │ Connection State          │
                    └───────────────────────────┘
```

Judgment Condition

1. At the initial power on, cooling operation is normally carried out. However, after a certain time passes (when defrost time comes), badness occurs on Refrigerating and freezing work. It is a case where there is defect on defrost part. Checkout whether there is defect on defrost system by Referring this trouble diagnosis.

9-3) Defrost function does not work

```
                                    ┌─────────────┐
                                    │    Start    │
                                    └──────┬──────┘
                                           │
* Refer to 7-7 self-diagnosis             ▼
  function of main function.        ╱ Is F, R defrost ╲    N
              ▲.................... ╲ sensor normal by ╱ ──────────────┐
              ┊                      ╲ self-diagnosis?╱                 │
              ┊                           │ Y                          ▼
              ┊                           ▼                  ┌──────────────────┐
              ┊                     ╱ Is F, R defrost ╲  N   │ Replace and repair│
              ┊.....................╲ heater normal by ╱─────│ the corresponding │
              ┊                      ╲ self-diagnosis?╱      │      sensor       │
* Refer to load defect checkup on         │ Y                └──────────────────┘
  this manual Ref 3.                      ▼
              ┊                     ╱ Is temperature  ╲  N   ┌──────────────────┐
              ┊.....................╲ of corresponding ╱─────│Check temperature │
              ┊                      ╲defrost sensor   ╱     │fuse, heater itself│
              ┊                       ╲ below -5°C?   ╱      │cord disconnection,│
* Judge in accordance with Ref 4          │ Y               │ cord contact state│
  and Ref 8 on this manual.               │                 └──────────────────┘
              ┊                           │                           │
              ┊                           │                           ▼
              ┊                           │                 ┌──────────────────┐
              ┊                           │                 │ Forced operation │
              ┊                           │                 │  for certain time│
              ┊                           │                 └──────────────────┘
              ┊                           ▼                           │
              ┊              ┌────────────────────────┐               │
              ┊.............│ Perform forced defrost  │◄──────────────┘
              ┊             │ for F and R             │
* Refer to 7-6) test        │ simultaneously.         │
  function of the           └────────────┬───────────┘
  main function.                         ▼
                                   ╱ Is power applied ╲   N
                                   ╲ to each defrost  ╱ ──────────┐
                                    ╲  heater?       ╱            │
                                         │ Y                      ▼
                                         ▼                      ( B )
                                       ( A )
```

Reference

1. If each EVA-SENSOR of F room and R room has open or short-related defect, electricity does not flow to defrost heater and it returns to normal operation after pause time passes. Therefore, if the period when defrost heater does not work accumulates, Refrigerating and freezing badness results.

2. If temperature fuse which is a safety device is turned off, or defrost heater has wire disconnection, or relay on PCB is bad, defrost is done by natural temperature rise. In this case, period of COMP off according to defrost becomes very long so that badness on Refrigerating and freezing function results.

```
                                              ┌───┐
                                              │ A │
                                              └─┬─┘
                                                ▼
                          N              ╱─────────────╲
              ┌.........................╱ Does it return to╲
              :                         ╲cold operation after heating for╲
              ▼                          ╲   certain time?  ╱
  ┌───────────────────────────┐          ╲─────────────╱
  │ Recheck troubles of corresponding │          │
  │ sensor that does not return. │          │ Y
  └───────────────────────────┘          ▼
              :                  ┌───────────────────────┐
              ▼                  │        Normal         │
  ┌───────────────────────────┐ └───────────────────────┘
  │ * When  temperature of F, R │
  │ defrost sensor reach more than +5°C │
  │ and +15°C  by heating, terminate │
  │ heating and convert into cooling │
  │   operation after pause. │
  └───────────────────────────┘
```

┌───┐
│ B │
└─┬─┘

╱─────────────────────╲
╱ Is connection terminal   ╲   N
╲ of MAIN-PCB part normal? ╲───────────────────┐
 ╲───────────────────╱   │
          │ Y   ▼
          ▼   ┌────────────────────────┐
┌─────────────────────────────┐   │ Repair connection terminal │
│ Check troubles on corresponding │   └────────────────────────┘
│ defrost heater relay, badness of PCB, │
│ and defect on normal/close terminal │
│   connection of COMP RELAY. │
└─────────────────────────────┘
          │   ▼
          ▼   ┌────────────────────────┐
┌─────────────────────────────┐   │ * Refer to load operation circuit │
│ Replace and repair bad relay or │   │ part and checkup method on │
│   replace PCB ASS'Y │   │   relay defect on Ref 2 │
└─────────────────────────────┘   └────────────────────────┘

9-4) Self-diagnosis Abnormality Occurs

① When abnormality on outer temperature sensor occurs

```
                    ┌──────────────────┐
                    │      Start        │
                    └──────────────────┘
                             │
                             ▼
                    ◇ Is insertion of        N
                      main PCB connecter(CN31) ─────────────┐
                      normal?                               │
                             │ Y                            ▼
                             ▼                    ┌──────────────────┐
                                                  │ Repair badness on │
                                                  │ connector contact │
 * Reference 4 ···· ◇ Is outer temperature   N   │   or omission     │
                      sensor forging normal? ─────────┐    └──────────────────┘
                             │ Y                       ▼
                             ▼                    ┌──────────────────┐
                                                  │ Replace temperature│
                                                  │     sensor         │
                    ◇ Is voltage input of    N   └──────────────────┘
                      MICOM PIN #60 normal? ──────────┐
                             │ Y                       ▼
                             ▼                    ┌──────────────────┐
                                                  │ Check main-PCB cold│
                    ┌──────────────────┐          │   lead or short    │
                    │ No defect on PCB  │          └──────────────────┘
                    │ and temperature   │
                    │ sensor. Recheck   │
                    │ connector contact │
                    │     badness       │
                    └──────────────────┘
```

② When abnormality of temperature sensor of Refrigerator occurs

```
                    ┌──────────────────┐
                    │      Start        │
                    └──────────────────┘
                             │
                             ▼
 * Reference 4 ···· ◇ Is outer temperature   N
                      sensor forging normal? ─────────────┐
                             │ Y                           ▼
                             ▼                    ┌──────────────────┐
                                                  │ Replace temperature│
                    ◇ Is insertion of        N   │     sensor.        │
                      MAIN-PCB connector(CN30) ──┐ └──────────────────┘
                      normal?                     ▼
                             │ Y          ┌──────────────────┐
                             ▼            │ Badness on connector│
                                          │ contact. Re-insert. │
                    ◇ Is connection cord   N └──────────────────┘
                      between main-PCB connector ──┐
                      (CN30) sensors?               ▼
                             │ Y          ┌──────────────────┐
                             ▼            │ Disconnection of wire│
                                          │ between connector and│
                    ◇ Is input voltage of  N │    sensor.        │
                      MICOM PIN #58 normal? ──┐ └──────────────────┘
                             │ Y              ▼
                             ▼          ┌──────────────────┐
                    ┌──────────────────┐│ Check cold lead, short,│
                    │ No defect on PCB  ││   lead touch.      │
                    │ and temperature   │└──────────────────┘
                    │ sensor. Recheck   │
                    │ connector contact │
                    │     badness       │
                    └──────────────────┘
```

③ When abnormality on defrost sensor of Refrigerator occurs.

```
                         ┌─────────────────┐
                         │      Start      │
                         └────────┬────────┘
                                  │
                                  ▼
                            ╱──────────╲           N
                     Is  insertion of      ─────────────────┐
                     MAIN-PCB connector(CN30)                │
                           normal?                           ▼
                            ╲──────────╱         ┌──────────────────────┐
                                  │ Y            │ Repair contact badness on │
                                  ▼              │ connector(CN30) and un- │
  * Reference 4          ╱──────────╲    N       │     inserted part     │
                     Is  defrost sensor  ────────┐└──────────────────────┘
                     forging normal?              │
                            ╲──────────╱          ▼
                                  │ Y    ┌──────────────────────┐
                                  ▼      │ Replace temperature sensor │
                            ╱──────────╲ └──────────────────────┘
                      Is  connection
                     between defrost sensor and  N
                      connector normal?  ────────┐
                            ╲──────────╱          ▼
                                  │ Y    ┌──────────────────────┐
                                  ▼      │  Repair the un-inserted │
                            ╱──────────╲ │ Connecter or contact badness. │
                      Is  voltage input of     N └──────────────────────┘
                     MICOM PIN#59 normal? ──────┐
                            ╲──────────╱         ▼
                                  │ Y   ┌──────────────────────┐
                                  ▼     │ Check cold lead, short and │
                    ┌──────────────────┐│       lead touch       │
                    │ No defect on PCB and temperature │
                    │ sensor. Recheck connector contact │
                    │        badness        │
                    └──────────────────┘
```

④ When abnormality on temperature sensor of freezer occurs

```
                         ┌─────────────────┐
                         │      Start      │
                         └────────┬────────┘
                                  │
                                  ▼
                            ╱──────────╲           N
                     Is  insertion of main-PCB  ───────────┐
                     connector(CN30) normal?                │
                            ╲──────────╱                    ▼
                                  │ Y            ┌──────────────────────┐
                                  ▼              │ Repair contact badness on │
  * Reference 4          ╱──────────╲    N       │ connector(CN30) and un- │
                     Is  defrost sensor  ────────┐│    inserted part.     │
                     forging normal?              │└──────────────────────┘
                            ╲──────────╱          ▼
                                  │ Y    ┌──────────────────────┐
                                  ▼      │ Replace temperature sensor │
                            ╱──────────╲ └──────────────────────┘
                      Is  connection
                     between defrost sensor and  N
                      connector normal?  ────────┐
                            ╲──────────╱          ▼
                                  │ Y    ┌──────────────────────┐
                                  ▼      │  Repair the un-inserted │
                            ╱──────────╲ │ Connecter or contact badness. │
                      Is  voltage input of     N └──────────────────────┘
                     MICOM PIN#56 normal? ──────┐
                            ╲──────────╱         ▼
                                  │ Y   ┌──────────────────────┐
                                  ▼     │ Check cold lead, short and │
                    ┌──────────────────┐│       lead touch       │
                    │ No defect on PCB and temperature │
                    │ sensor. Recheck connector contact │
                    │        badness        │
                    └──────────────────┘
```

⑤ When abnormality on defrost sensor of freezer occurs

```
                        ┌─────────────────┐
                        │      Start      │
                        └─────────────────┘
                                 │
                        ╱─────────────────╲
                       ╱  Is  insertion of ╲        N      ┌──────────────────────────┐
                      ╱  MAIN-PCB connector ╲──────────────│ Repair contact badness on│
                      ╲     (CN30) normal?  ╱              │  connector(CN30) and un- │
                       ╲───────────────────╱              │      inserted part.      │
                                 │ Y                       └──────────────────────────┘
                        ╱─────────────────╲
  * Reference 4 ········╱   Is  defrost sensor ╲    N       ┌──────────────────────────┐
                      ╲  forging normal?    ╱──────────────│ Replace  temperature     │
                       ╲───────────────────╱              │      sensor              │
                                 │ Y                       └──────────────────────────┘
                        ╱─────────────────╲
                       ╱  Is  connection    ╲    N
                      ╱ between defrost sensor╲─────────────┐
                      ╲ and connector normal? ╱             │
                       ╲───────────────────╱              ┌──────────────────────────┐
                                 │ Y                       │ Repair the un-inserted   │
                        ╱─────────────────╲                │ Connecter or contact     │
                       ╱  Is  voltage input  ╲    N        │ badness.                 │
                      ╱ of MICOM PIN#57 normal?╲────────────└──────────────────────────┘
                      ╲───────────────────────╱            
                                 │ Y                       ┌──────────────────────────┐
      ┌───────────────────────────────────┐                │ Check  cold lead, short  │
      │ No defect on PCB and temperature   │                │      and lead touch      │
      │ sensor. Recheck connector contact  │                └──────────────────────────┘
      │ badness                            │
      └───────────────────────────────────┘
```

9-5) When alarm is continuously ringing

① When Ding-Dong sound continuously occurs

```
                        ┌─────────────────┐
                        │      Start      │
                        └─────────────────┘
                                 │
                        ╱─────────────────╲
                       ╱  Is there any      ╲    N
                      ╱ penetration of moisture╲──────────────┐
                      ╲  to door s/w?       ╱                 │
                       ╲───────────────────╱              ┌──────────────────────────┐
                                 │ Y                       │   Replace  DOOR S/W      │
                        ╱─────────────────╲                └──────────────────────────┘
                       ╱  Do input voltages  ╲    N
                      ╱ of MICOM PIN #45, #46 ╲──────────────┐
                      ╲  change?             ╱                │
                       ╲──────────────────╱                ┌──────────────────────────┐
                        (DOOR OPEN/CLOSE)│ Y                │ Repair cord disconnection│
                        ╱─────────────────╲                │ and badness DOOR S/W     │
                       ╱  Is  insertion of   ╲    N         └──────────────────────────┘
                      ╱ MAIN-PCB connector    ╲──────────────┐
                      ╲  (CN30) normal?       ╱               │
                       ╲───────────────────╱              ┌──────────────────────────┐
                                 │ Y                       │ Repair the un-inserted   │
                        ╱─────────────────╲                │ Connecter or contact     │
                       ╱  Is DOOR S/W itself  ╲    N        │ badness.                 │
                      ╲   normal?           ╱──────────────└──────────────────────────┘
                       ╲───────────────────╱              
                                 │ Y                       ┌──────────────────────────┐
      ┌───────────────────────────────────┐                │   Replace  DOOR S/W      │
      │ MAIN-PCB and DOOR S/W are normal   │                └──────────────────────────┘
      └───────────────────────────────────┘
```

┌── Reference ──┐
│   │
│ • Alarm for freezer/Refrigerator door open continues for 10sec. at the initial   │
│   door open. After 2 min. of initial opening, it alarms for 10sec. by the 1min.   │
│   cycle when door remains open (10 times of Ding-Dong sound).   │
└──┘

② When "Beep-Beep" sound continuously occurs

```
                    ┌─────────────────────┐
                    │        Start        │
                    └─────────────────────┘
                               │
                               ▼
                        ╱─────────────╲
                       ╱  Isn't forced  ╲          N        ┌──────────────────────┐
                      ╱ operation or defrost ╲─────────────▶│ Cancel forced operation or │
                       ╲   selected?    ╱                   │      defrost.         │
                        ╲─────────────╱                     └──────────────────────┘
                               │ Y                                     │
                               ▼                                       ▼
                        ╱─────────────╲
                       ╱ Does  buzzer   ╲         N         ┌──────────────────────┐
                      ╱ sound occurs if power ╲────────────▶│   MAIN-PCB is normal  │
                       ╲   is reset?   ╱                    │                       │
                        ╲─────────────╱                     └──────────────────────┘
                               │ Y
                               ▼
              ┌─────────────────────────────────┐
              │ Check dirt insertion and short on  test │
              │ jumper part inside of the MAIN-PCB │
              └─────────────────────────────────┘
```
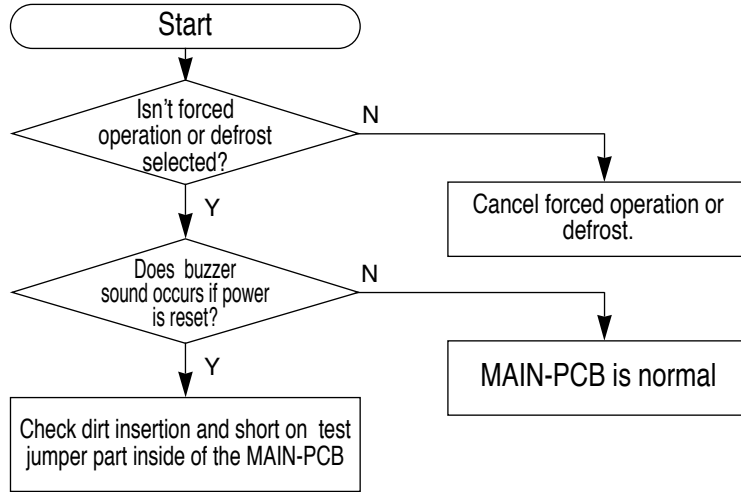
Reference

- Sound of "Beep-Beep" does not occur except abnormalities due to forced operation, defrost or self-diagnosis abnormality.
- In case of self-diagnosis abnormality, it is easy to check because it is indicated on panel-display. If "Beep-Beep" sound continues to ring though panel display is normal, it is considered that forced operation or defrost is selected.
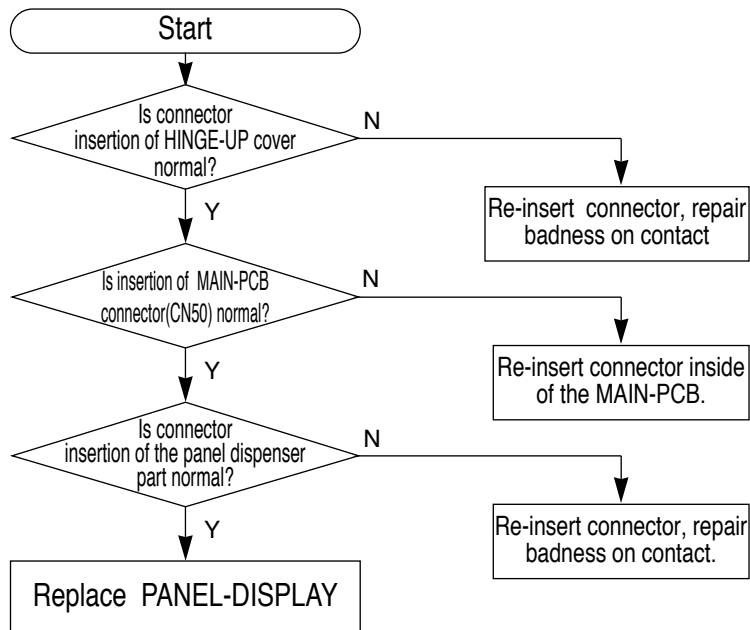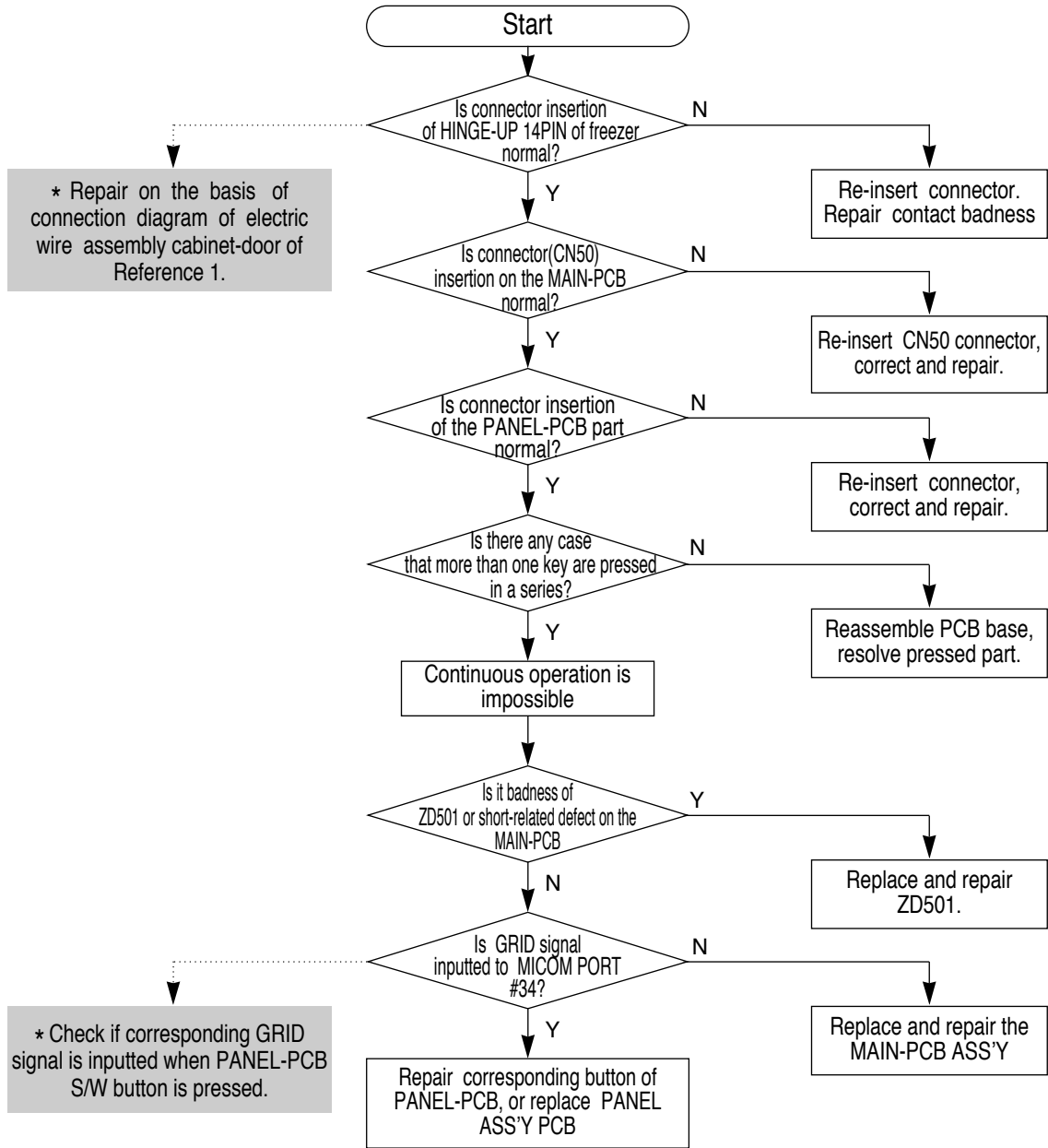
③ In case PANEL-DISPLAY is not lit

```
                    ┌─────────────────────┐
                    │        Start        │
                    └─────────────────────┘
                               │
                               ▼
                        ╱─────────────╲
                       ╱  Is connector  ╲          N        ┌──────────────────────┐
                      ╱ insertion of HINGE-UP cover ╲──────▶│ Re-insert  connector, repair │
                       ╲   normal?     ╱                    │   badness on contact  │
                        ╲─────────────╱                     └──────────────────────┘
                               │ Y                                     │
                               ▼                                       ▼
                        ╱─────────────╲
                       ╱ Is insertion of  MAIN-PCB ╲   N    ┌──────────────────────┐
                      ╱ connector(CN50) normal? ╲──────────▶│ Re-insert connector inside │
                       ╲               ╱                    │   of the MAIN-PCB.    │
                        ╲─────────────╱                     └──────────────────────┘
                               │ Y                                     │
                               ▼                                       ▼
                        ╱─────────────╲
                       ╱  Is connector  ╲          N        ┌──────────────────────┐
                      ╱ insertion of the panel dispenser ╲─▶│ Re-insert connector, repair │
                       ╲  part normal?  ╱                   │  badness on contact.  │
                        ╲─────────────╱                     └──────────────────────┘
                               │ Y
                               ▼
              ┌─────────────────────────────────┐
              │      Replace  PANEL-DISPLAY     │
              └─────────────────────────────────┘
```

④ When key selection of PANEL-DISPLAY is not available

```
                              ┌──────────────────────────┐
                              │          Start            │
                              └──────────────────────────┘
                                          │
                                          ▼
                              ╱◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇╲            ┌───────────────────────┐
┌────────────────────────┐   ◇ Is connector insertion  ◇  N  │ Re-insert connector.  │
│ * Repair on the basis of│   ◇ of HINGE-UP 14PIN of    ◇────▶│ Repair contact badness │
│ connection diagram of   │◀··◇   freezer normal?        ◇    └───────────────────────┘
│ electric wire assembly  │   ╲◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇╱
│ cabinet-door of         │            │ Y
│ Reference 1.            │            ▼
└────────────────────────┘   ╱◇◇◇◇◇◇◇◇◇◇◇◇◇◇╲               ┌───────────────────────┐
                              ◇ Is connector(CN50)  ◇  N     │ Re-insert CN50        │
                              ◇ insertion on the     ◇──────▶│ connector, correct    │
                              ◇ MAIN-PCB normal?     ◇       │ and repair.           │
                              ╲◇◇◇◇◇◇◇◇◇◇◇◇◇◇╱               └───────────────────────┘
                                       │ Y
                                       ▼
                              ╱◇◇◇◇◇◇◇◇◇◇◇◇◇◇╲               ┌───────────────────────┐
                              ◇ Is connector insertion ◇  N  │ Re-insert connector,  │
                              ◇ of the PANEL-PCB part   ◇───▶│ correct and repair.   │
                              ◇      normal?            ◇    └───────────────────────┘
                              ╲◇◇◇◇◇◇◇◇◇◇◇◇◇◇╱
                                       │ Y
                                       ▼
                              ╱◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇╲              ┌───────────────────────┐
                              ◇ Is there any case       ◇  N │ Reassemble PCB base,  │
                              ◇ that more than one key   ◇──▶│ resolve pressed part.  │
                              ◇ are pressed in a series? ◇   └───────────────────────┘
                              ╲◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇╱
                                       │ Y
                                       ▼
                              ┌──────────────────────┐
                              │ Continuous operation  │
                              │ is impossible         │
                              └──────────────────────┘
                                       │
                                       ▼
                              ╱◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇╲              ┌───────────────────────┐
                              ◇ Is it badness of        ◇  Y │ Replace and repair    │
                              ◇ ZD501 or short-related   ◇──▶│ ZD501.                │
                              ◇ defect on the MAIN-PCB   ◇   └───────────────────────┘
                              ╲◇◇◇◇◇◇◇◇◇◇◇◇◇◇◇╱
                                       │ N
                                       ▼
┌────────────────────────┐   ╱◇◇◇◇◇◇◇◇◇◇◇◇◇◇╲              ┌───────────────────────┐
│ * Check if corresponding│   ◇ Is GRID signal       ◇  N   │ Replace and repair the │
│ GRID signal is inputted  │◀··◇ inputted to MICOM     ◇────▶│ MAIN-PCB ASS'Y        │
│ when PANEL-PCB S/W       │   ◇ PORT #34?            ◇      └───────────────────────┘
│ button is pressed.       │   ╲◇◇◇◇◇◇◇◇◇◇◇◇◇◇╱
└────────────────────────┘            │ Y
                                       ▼
                              ┌──────────────────────┐
                              │ Repair corresponding  │
                              │ button of PANEL-PCB,  │
                              │ or replace PANEL      │
                              │ ASS'Y PCB             │
                              └──────────────────────┘
```

9-6) When FAN does not work

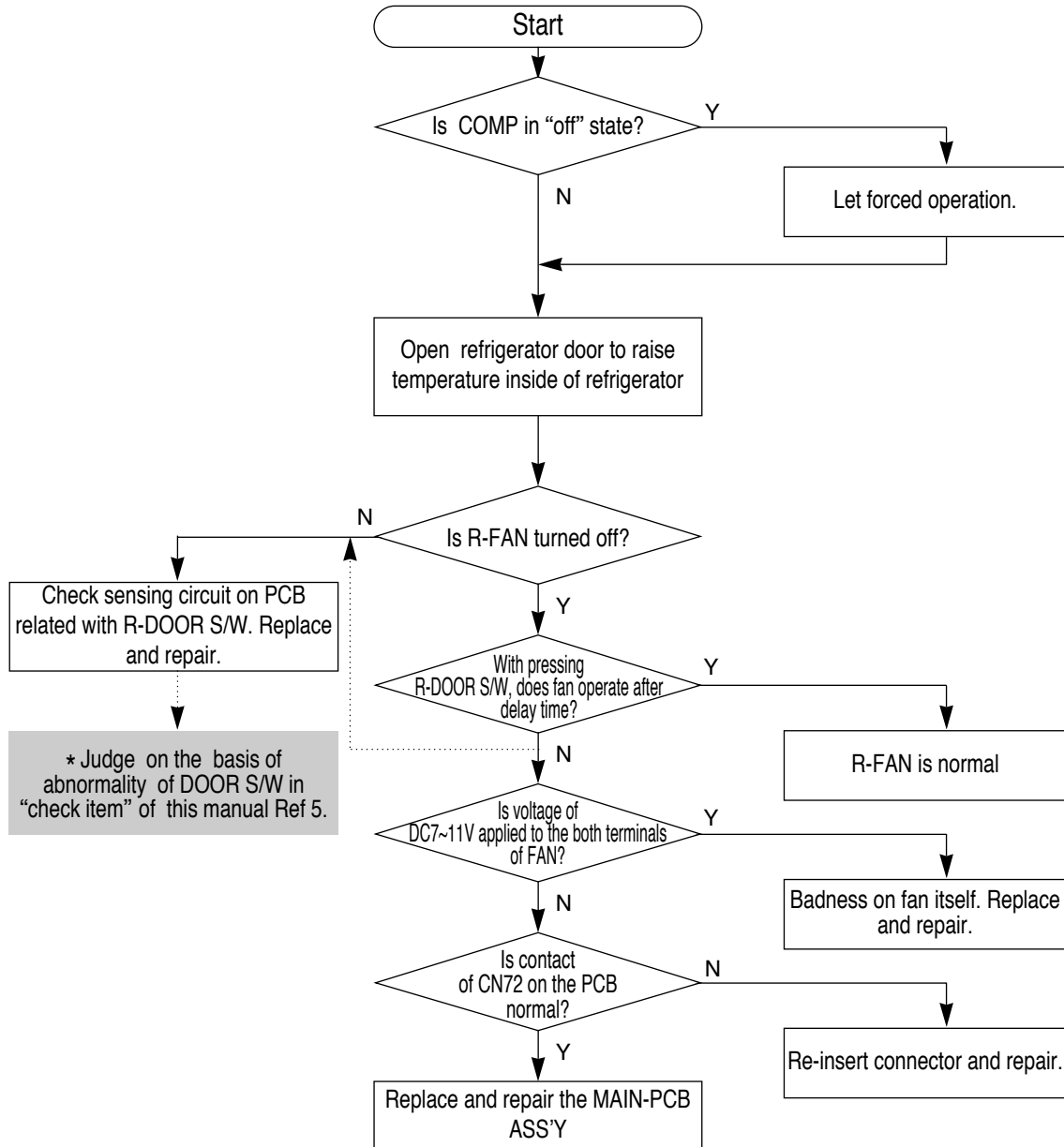① When FAN of freezer(F-FAN) does not work (when COMP operates normally by temperature).

```
                          ┌──────────────────┐
                          │      Start        │
                          └──────────────────┘
                                   │
                                   ▼
                          ◇ Is COMP in "off" state? ◇────Y────┐
                                   │                           ▼
                                   N                  ┌──────────────────┐
                                   │                  │ Allow forced      │
                                   ▼                  │ operation.        │
                          ┌──────────────────┐        └──────────────────┘
                          │ Open freezer door │◄────────────┘
                          └──────────────────┘        * Check only at the condition where
                                   │                    Refrigerator door is closed.
                                   ▼
          N ◄─────────── ◇ Is F-FAN turned off? ◇
          │                        │
          ▼                        Y
  ┌──────────────────┐             ▼
  │ Check sensing     │    ◇ When pressing F-DOOR S/W, ◇──Y──┐
  │ circuit on PCB     │    ◇ does FAN operate after   ◇      ▼
  │ related with       │    ◇ delay time?              ◇  ┌──────────────────┐
  │ F-DOOR S/W.        │             │                    │ F-FAN is normal.  │
  │ Replace and repair.│             N                    └──────────────────┘
  └──────────────────┘             ▼
                         ◇ Is voltage of DC7~11V  ◇──Y──┐
  * Judge on the basis   ◇ applied to both         ◇    ▼
  of abnormality of      ◇ terminals of fan?       ◇ ┌──────────────────┐
  DOOR S/W in "check               │                 │ Badness of fan    │
  item" of this manual             N                 │ itself. Replace   │
  Ref 5.                           ▼                 │ and repair        │
                         ◇ Is contact of CN72 ◇──N──┐└──────────────────┘
                         ◇ on PCB normal?     ◇     ▼
  * Refer to checkup               │            ┌──────────────────┐
  method of relay                  Y            │ Re-insert          │
  badness on Ref 2.                ▼            │ connector and      │
                         ┌──────────────────┐   │ repair.            │
                         │ Replace and repair │  └──────────────────┘
                         │ MAIN-PCB ASS'Y.    │
                         └──────────────────┘
```

Reference

"Check cooling fan only at the condition of selecting forced operation necessarily."

1. When COMP is turned off, cooling fan of freezer(F-FAN), cooling fan of Refrigerator(R-FAN), COMP, and cooling fan of COMP mostly retains "off" state. However, in case of R-FAN, it can operate for some period of time by natural defrost function if COMP is turned off.(It operates depending on temperature condition of Refrigerator)

2. Evenat forced operation condition, R-FAN is not always turned on (including normal operation), and retains "off" state if temperature of Refrigerator room is reached the set temperature.

3. When the door of freezer and Refrigerator is closed after opening, each fan has its delay time. That is, fan stops immediately when door is opened during its operation, and operates again after delay of about 10sec. or 1min. (when outer temperature is over 35°C) when the door is closed.

② When Refrigerator fan (R-FAN) does not work (when temperature sensing function in Refrigerator room is normal).

```
                          ┌─────────────┐
                          │    Start    │
                          └──────┬──────┘
                                 │
                          ◇ Is COMP in "off" state? ◇ ──Y──┐
                                 │                          │
                                 N                   ┌──────────────────┐
                                 │                   │ Let forced       │
                                 │                   │ operation.       │
                                 │                   └────────┬─────────┘
                                 │◄───────────────────────────┘
                                 │
                     ┌───────────────────────────┐
                     │ Open refrigerator door to  │
                     │ raise temperature inside   │
                     │ of refrigerator            │
                     └─────────────┬──────────────┘
                                   │
        N ◄──────────── ◇ Is R-FAN turned off? ◇
        │                          │
┌───────────────────────┐         Y
│ Check sensing circuit  │         │
│ on PCB related with    │  ◇ With pressing R-DOOR S/W,  ──Y──┐
│ R-DOOR S/W. Replace    │    does fan operate after          │
│ and repair.            │    delay time? ◇           ┌───────────────┐
└───────────┬───────────┘         │                   │ R-FAN is      │
            │                      N                   │ normal        │
┌───────────────────────┐         │                   └───────────────┘
│ * Judge on the basis   │  ◇ Is voltage of DC7~11V  ──Y──┐
│ of abnormality of      │    applied to the both         │
│ DOOR S/W in "check     │    terminals of FAN? ◇   ┌──────────────────┐
│ item" of this manual   │         │                 │ Badness on fan   │
│ Ref 5.                 │         N                 │ itself. Replace  │
└───────────────────────┘         │                 │ and repair.      │
                           ◇ Is contact of           └──────────────────┘
                             CN72 on the PCB  ──N──┐
                             normal? ◇             │
                                   │         ┌──────────────────┐
                                   Y         │ Re-insert        │
                           ┌──────────────┐  │ connector and    │
                           │ Replace and  │  │ repair.          │
                           │ repair the   │  └──────────────────┘
                           │ MAIN-PCB     │
                           │ ASS'Y        │
                           └──────────────┘
```

⚠ Caution

There exists the risk of electric shock when replacing the lamp inside of
Refrigerator. Replace and repair at only "power off" state.

9-7) When lamp inside of Refrigerator is not lit.

```
                         ┌─────────────────┐
                         │      Start      │
                         └────────┬────────┘
                                  │
                                  ▼
                          ◇ Is connector contact        N    ┌──────────────────────┐
            ┌ ─ ─ ─ ─ ─ ─  inside of Refrigerator  ─────────▶│ Re-insert connector and │
            │             ◇   normal?                        │        repair.          │
            ▼                     │ Y                         └──────────────────────┘
  ┌──────────────────────┐        ▼
  │ * Inside of cover of │     ◇ Is filament of LAMP broken? ─── Y ──┐
  │   Refrigerator LAMP  │        │ N                                ▼
  └──────────────────────┘        │                        ┌──────────────────────┐
                          N        ▼                        │  Replace LAMP in the │
            ┌ ─ ─ ─ ─ ─ ─  ◇ Is there any                   │     Refrigerator.    │
            │              abnormality on connection point of       └──────────────────────┘
            ▼              ◇ R-DOOR S/W?
  ┌──────────────────────┐        │ Y
  │ Check and repair     │        ▼
  │ R-DOOR S/W.          │   ┌──────────────────────────────┐
  └──────────┬───────────┘   │ Check if voltage of 230V is applied │
             │               │ to socket of R-LAMP and repair.     │
             ▼               └──────────────────────────────┘
  ┌──────────────────────┐
  │ ❉ Check on the basis of│
  │ abnormality checking method for│
  │ DOOR S/W of Ref 5.   │
  └──────────────────────┘
```

There exists the risk of electric shock when replacing the lamp inside of freezer room. Replace and repair at only "power off" state.

9-8) When lamp inside of freezer is not lit.

```
                          ┌─────────────────┐
                          │     Start       │
                          └────────┬────────┘
                                   │
                                   ▼
                          ╱─────────────────╲          N
           ............◁─┤  Is connector     ├──────────────┐
           ┊             ╲ contact inside of ╱              │
           ┊              ╲    freezer      ╱               ▼
           ┊               ╲   normal?     ╱        ┌─────────────────┐
           ┊                ╲─────┬───────╱         │ Re-insert        │
           ▼                      │ Y                │ connector and    │
 ┌─────────────────────────┐     ▼                  │ repair.          │
 │ ✳ Inside of cover of    │  ╱──────────────╲  Y   └─────────────────┘
 │   FREEZER-LAMP          │ ┤ Is filament of ├──────────┐
 └─────────────────────────┘ ╲ LAMP broken?  ╱           │
                              ╲──────┬───────╱            ▼
                                     │ N         ┌─────────────────┐
                                     ▼           │ Replace LAMP in  │
                          ╱───────────────────╲  │ the freezer.     │
           N              │   Is there any     │  └─────────────────┘
  ............◁──────────┤ abnormality on     │
  ┊                       ╲ connection point of╱
  ┊                        ╲   F-DOOR S/W?    ╱
  ┊                         ╲───────┬────────╱
  ▼                                 │ Y
 ┌─────────────────────────┐        ▼
 │ Check and repair         │  ┌─────────────────────────────┐
 │ F-DOOR S/W.              │  │ Check if voltage of 230V is   │
 └─────────────────────────┘  │ applied to socket of F-LAMP   │
  ┊                           │ and repair.                   │
  ▼                           └─────────────────────────────┘
 ┌─────────────────────────┐
 │ ✳ Check on the basis of  │
 │ abnormality checking     │
 │ method for DOOR S/W of   │
 │ Ref 5.                   │
 └─────────────────────────┘
```

9-9) Abnormality diagnosis method for ICE-MAKER

Power Resource Terminal Check

Is DC electricity (5V, 12V) normally outputted? — N → Badness of power resource terminal → Replace the MAIN-PCB

Y

Is ICE-MAKER dish horizontal? — N → Disconnect connector like Ref. 8

Y

Kit Check (CN90 Terminal WIRE HARNESS)

Is resistance between both ends (between ① and ②) of ice-eject motor within range of 18~22 Ω ? — N → Badness on motor

Y

Is TEST S/W(both ends of ⑤ and ⑧) open? — N → Badness on TEST S/W

Y

Is horizontal S/W(both ends of ⑥ and ⑧) open? — N → Badness on MICRO S/W

Y

Is ice-check S/W (both ends of ⑦ and ⑧) open? — N → Badness on MICRO S/W

Y

Sensor Check (Ref. 4)

Is ice-eject sensor (both ends of ③ and ④) within range written on table of Ref. 8? — N → Badness on ice-eject sensor

Y

Motion Check

Pressing test s/w for more than 1.5sec., does it normally perform ice-eject and horizontal restoration and generate sound of "Ding-Dong" for one time? — N → Badness on kit ASS'Y → Replace kit ASS'Y

Y

Normal

9-10) When cube and crushed ice are not normally operated.

① When cube ice does not come out when cold cube ice is selected.

```
                          ┌─────────────┐
                          │    Start     │
                          └──────┬──────┘
                                 │
              Y          ╱ When cube ice is ╲        N
        ┌───────────────◇ selected, does cube ice ◇─────────────┐
        │                ╲   come out?   ╱                        │
        │                 ╲            ╱                          ▼
        │                                            ┌──────────────────────┐
        │                                            │ Isn't freezer door    │
        │                                            │ open? Close the door  │
        │                                            │ if it is open.        │
        │                                            └──────────┬───────────┘
        │                                                       │
        │              Y        ╱ When ice lever is ╲           │
        │◀─────────────────────◇ operating, does cube ice ◇◀────┘
        │                       ╲   come out?   ╱
        │                                │ N
        │                       ╱ Is micro port #20 on ╲     N
        │                      ◇ MAIN-PCB "HIGH"?       ◇─────────────┐
        │                       ╲                     ╱               ▼
        │                                │ Y              ┌──────────────────────┐
        │                                                 │ Replace and repair    │
        │                                                 │ MAIN-PCB ASS'Y        │
        │                                                 └───────────────────────┘
        │                       ╱ Is relay K76 turned ╲   N
        │                      ◇     on?               ◇─────────────┐
        │                       ╲                     ╱               ▼
        │                                │ Y              ┌──────────────────────┐
        │                                                 │ Replace and repair    │
        │                                                 │ relay RY76.           │
        │                                                 └───────────────────────┘
        │                    ╱ Does drill motor  ╲        N
        │                   ◇ solenoid inside of   ◇───────────────┐
        │                    ╲ freezer operate    ╱                ▼
        │                     ╲  normally?  ╱          ┌──────────────────────┐
        │                                │ Y            │ Check lead wire and   │
        │                                               │ repair defected part  │
        │                                               └───────────────────────┘
        │                    ╱ Is tap water normally ╲   N
        │                   ◇     supplied?           ◇───────────────┐
        │                    ╲                       ╱                 ▼
        │                                │ Y              ┌──────────────────────┐
        │                                                 │ Re-check the water    │
        │                                                 │ supply point.         │
        └────────────────────────────┐  │                └───────────────────────┘
                                      ▼  ▼ Y
                               ┌──────────────┐
                               │    Normal     │
                               └──────────────┘
```

Reference

※ When motion system is normal, however, if there is no ice in the ice container, ice does not come out. Please ensure whether there is ice in the ice container.

9-11) When solenoid which is cover ice-route delay device does not work

Pre-checkup

1. Check whether solenoid automatically operates for 0.3sec. regardless of open/close of cover ice-route 8 sec. after initial power on.
2. Check whether Hinge-up connector contact is normal.

```
                              ┌──────────────┐
                              │    Start     │
                              └──────┬───────┘
                                     │
                          ◇ Does S/V operate for          N
                            0.3 sec. when 8 sec. are passed after initial ──────────┐
                                 power on?                                           │
                                     │ Y                                             │
                          ┌──────────────────────┐                                  │
                          │ No defect on S/V control│                               │
                          │ PCB ASS'Y and wire system│◄──────────────┐             │
                          └──────────┬───────────┘                    │             ▼
                                     │ N                     ◇ With the initial power on,   N
  ┌─────────────┐        ◇ When ice lever is   N           does MICOM #18 on PCB indicate "HIGH" ──────┐
  │Check and repair│◄──── pressed, does it maintain          state for 0.3sec.?                          │
  │devices such as │      open state?                            │ Y                           ┌──────────────┐
  │stopper lever & │            │ Y                     ┌────────────────────────┐            │ Replace MAIN-│
  │support, etc    │            │                       │ MICOM control port is  │◄───────────│ PCB ASS'Y    │
  └─────────────┘        ◇ At door-closed state,  N     │ normal                 │            └──────────────┘
  ┌─────────────┐        does ice conveying motor operate └──────────┬───────────┘
  │Check ICE S/W.│◄───── if ICE S/W is turned on?                    │
  │Check and repair│            │ Y                      ◇ After 8sec. from the point      N
  │wire connection │            │                         of initial power on, does IC03 #12 ──────┐
  │system          │      ◇ Is cover closed       N       indicate "LOW" state for 0.3sec.?   ┌──────────┐
  └─────────────┘        after about 5sec. by S/V ───────┐      │ Y                           │Badness of│
                          operation?                      │  ┌──────────────────┐            │IC03.     │
                                │ Y                        │  │Exchange defected │            │Exchange  │
                     ┌────────────────────┐                │  │parts after checking│          └────┬─────┘
                     │No defect on cover  │                │  │SSR71 or replace   │               │
                     │ice-route control   │                │  │PCB ASS'Y.         │          ┌──────────┐
                     │system              │                │  └──────────────────┘          │Utilize checkup│
                     └────────────────────┘                                                  │method for SSR│
                                                                                             │defection of Ref. 2│
                                                                                             └──────────┘
```

Reference

✻ S/V is abbreviation of Solenoid Valve

10-1) Operation Principle of ICE-MAKER

```
        ┌─────────────┐
        │    Start    │
        └─────────────┘
               │
               ▼
          ╱─────────╲          Y
◄────────◄ Is it horizontal? ►────────┐
│         ╲─────────╱                  │
│              │ N                     ▼
│         ┌──────────┐          ┌─────────────┐
│         │ Reverse- │          │ice-eject motor│
│         │rotation of ice-     │    stop      │
│         │eject motor│         └─────────────┘
└─────────┤          │                 │
          └──────────┘                 ▼
                              ┌─────────────┐
                              │Wait for 1 cycle│
                              │ (under -7˚C) │
                              └─────────────┘
                                     │
                                     ▼
                              ┌─────────────┐
                              │Ice-eject step│
                              └─────────────┘
                                     │
                                     ▼
                              ┌─────────────┐
                              │Water supply │
                              │    step     │
                              └─────────────┘
                                     │
                                     ▼
                              ┌─────────────┐
                              │Ice-making step│
                              └─────────────┘
                                     │
                                     ▼
                              ┌─────────────┐
                              │  Test step  │
                              └─────────────┘
```
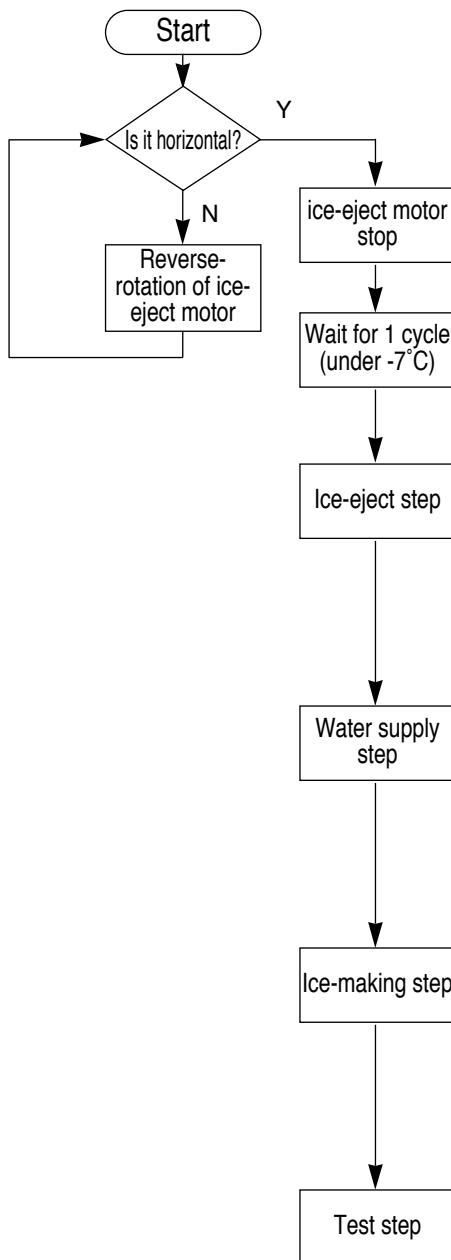
Performance of motion to retain horizontal level of ice-making dish for initial power apply or for restoration from stoppage of electric current.

Performance of ice-separation regardless of water supply to ice-making dish by waiting for 1 cycle.

After ice-making is finished, motion of ice-separation from ice on dish into storage container. Ice-separation is performed by checking the horizontal s/w, and the signal change of ice-inspection s/w and the changed time. They should be checked together in parallel.

After ice-making is finished, motion to supply ice-making water to ice-tray using water valve.

This step means the period from when water supply is finished to when it is judged that water turned into ice completely. This is judged by parallel checkup of temperature and time.

Function for cases which are needed for forced operation for the purpose of operation test, A/S, and cleaning.Ice-separation motion and water supply motion are conducted continually and this step should have priority than any other operations.

5. Test Function
- It is function for the case which needs forced motion for the purpose of cleaning and so on at the time of operation test and A/S. This function is performed when the test s/w which is equipped with the body of automatic ice-maker itself, is pressed for more than 1.5 sec..

1) Test button does not go into test function during ice-eject, levelling for horizontal position and water supply. It operates in the horizontal state. It does not operate at the state where ice is fully filled. Only after ice full mode is cancelled and ice-check s/w is off, test function operates.

2) When test button is pressed in the horizontal state for more than 1.5sec., ice-eject motion starts immediately regardless of conditions of ice-making container. Therefore, if test function operates in the state where water does not freeze yet, water may be poured. So, care should be taken. After ice-eject motion, 1cycle of water supply is carried out in horizontal levelling movement. Therefore, the problems of ice-eject movement, horizontal levelling movement, and water supply can be checked by the test button. At this time, when the test function operates normally, buzzer sound "Ding-Dong" occurs and starts water supply function. Hence, if buzzer sound "Ding-Dong" doesn't occur, it may be considered that there is some abnormality so that check and repair are indispensable.

3) When water supply is finished, it operates in normal cycle of ice-making ➔ ice-eject ➔ horizontal restoration ➔ water supply in order.

<Case Where Test Function does not Work>

NO	Item	Measures to Operate	Remark
01	under operation	After finishing ice-eject, horizontal levelling and completion of water supply	
02	Ice is full	After removal of ice in ice container	Turn ice-check lever On ➔ Off.

6. Function according to F-Room Door Open
- This is function to minimize noise occurrence by stopping operation basically when door F-room opens.

1) If F-room door opens while ice-eject or horizontal levelling is working, the function stops immediately at this point of time. When the door is closed, function operates normally.

2) In case water is being supplied, normal function is performed regardless of door open of F-room.

3) Accordingly, when F-room door is opened to check, if tray leans or its angle deviates from horizontal position, it is considered that it stops during ice-eject or horizontal levelling movement. It doesn't matter to judge it as a defect if it is not in horizontal position after more than 30sec. passes when F-room door is closed to keep horizontal state after water supply. In case it stops by F-room door open while it is operating, Test function doesn't work because it is actually working. So, after finishing water supply, test function operates.

TMP87CK40
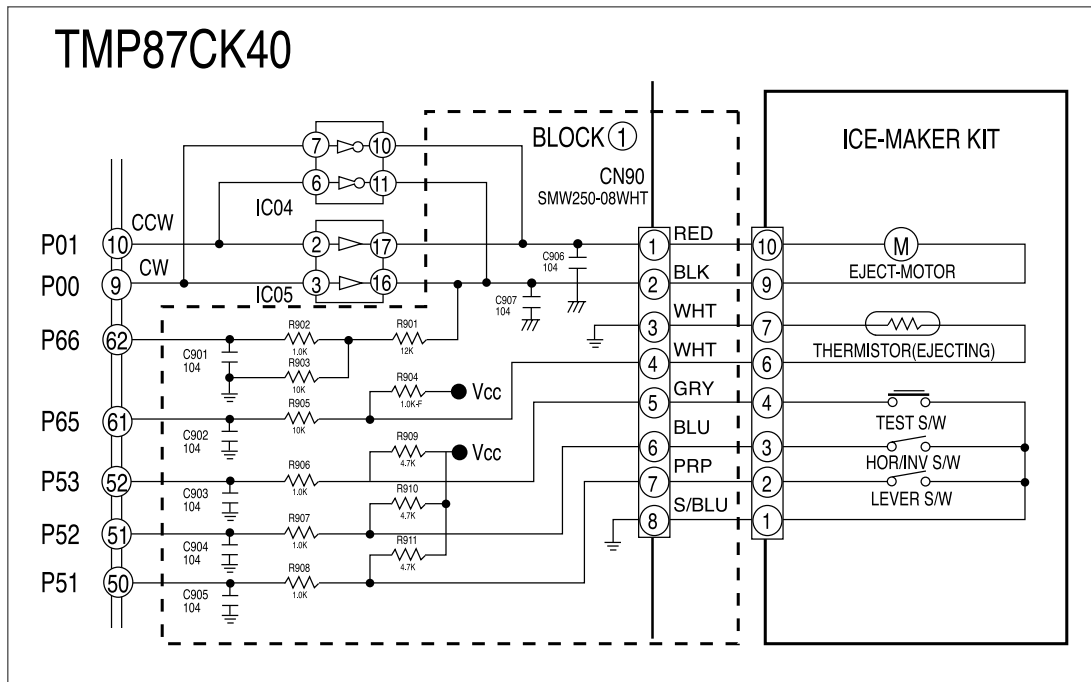
Above ice-maker circuit is one about a kit which is equipped at the freezer. Water supply to ice-making container is performed by operating AC solenoid which is located in the machine room through relay so that water is supplied by open/close time of valve. This circuit is H/W for embodiment of functions such as eject of ice-making container, horizontal levelling, ice-making temperature sensing and full-ice sensing. Temperature sensing part is identical to that of the main H/W, and horizontal(Hor/Inv) S/W, Ice-check(Lever) S/W and sensing circuit are identical to those of the main H/W. So, explanation about this is omitted here, and only ice-eject motor driving circuit part is explained.

When rotating motor in the counter-clockwise direction(CCW), if signal of Micom Port No #10 is outputted to High. When pressure of IC05 is applied, the voltage is applied of +12V by output of IC05 17, and the current is supplied to IC04 of ⑪ through motor. At this time, ⑥ terminal of IC04 is connected with CCW Port together so that output port of the corresponding IC04 ⑪ is turned on. Therefore, current flows to the ground and motor rotates inversely.

When it moves to clockwise direction(CW), CW Port #9 is outputted by "HIGH". The functions of ice-eject and horizontal levelling are performed by the operation of IC Port through right direction rotation movement.

For the points related with operation of above circuit, refer to the explanation of ice-maker function of our SVC Manual.

10-4) Designation of major components of Ice-Maker

ICE-MAKER, KIT

(EJECT-MOTOR)
SUPT-RUBBER
(EJECT-SENSOR)
(TRAY-ICE)
HOR-SWITCH
LEVER-SWITCH
TEST-SWITCH
SCREW
FIXER-SENSOR
KNOB-TOUCH
GUIDE-ICE
COVER-SENSOR
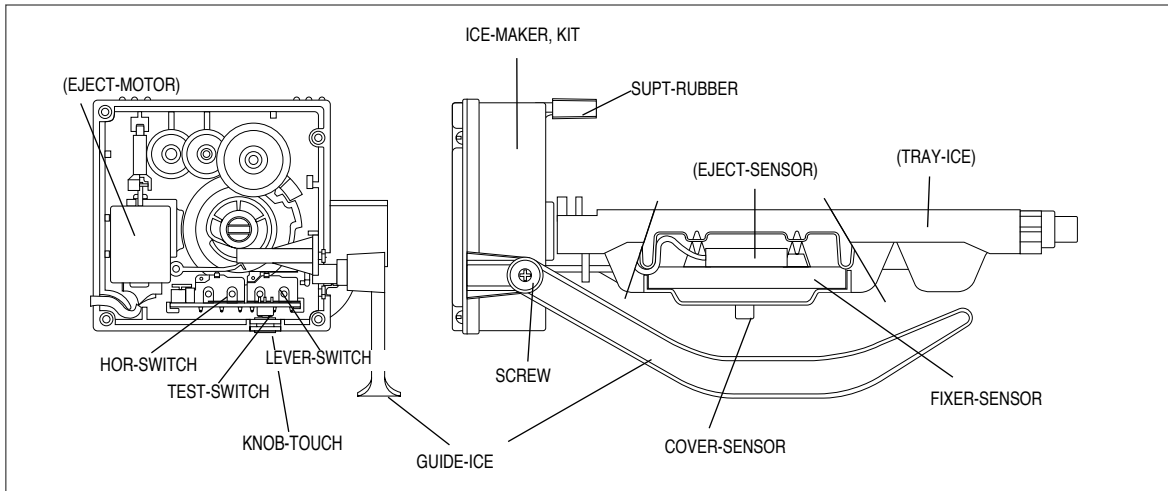
10-5) Operation of Ice-Maker

1. Connect the water-supply line to the supplying valve of the refrigerator to supply water.(See the water tube connection procedure)

2. Push bucket to the end so that guide-ice of ice-maker is not in contact with the end of bucket.(If the end of bucket is in contact with the guide-ice of the ice-maker, the ice-maker will determine that there is enough ice and does not make ice thereafter.)

3. With a newly installed refrigerator, allow about 6 hours for the refrigerator to make ice normally and discard the made ice several times to remove impurities.

4. To get enough ice stored in the storage bin, use the ice dispenser normally after operating the ice-maker for about 24 hours.

SUPT-ICE, MAKER

TRAY-ICE
GUIDE-ICE
BUCKET
ICE-MAKER KIT

Push the bucket to the end so that the GUIDE-ICE of the ICE-MAKER is not in contact with the end of bucket.
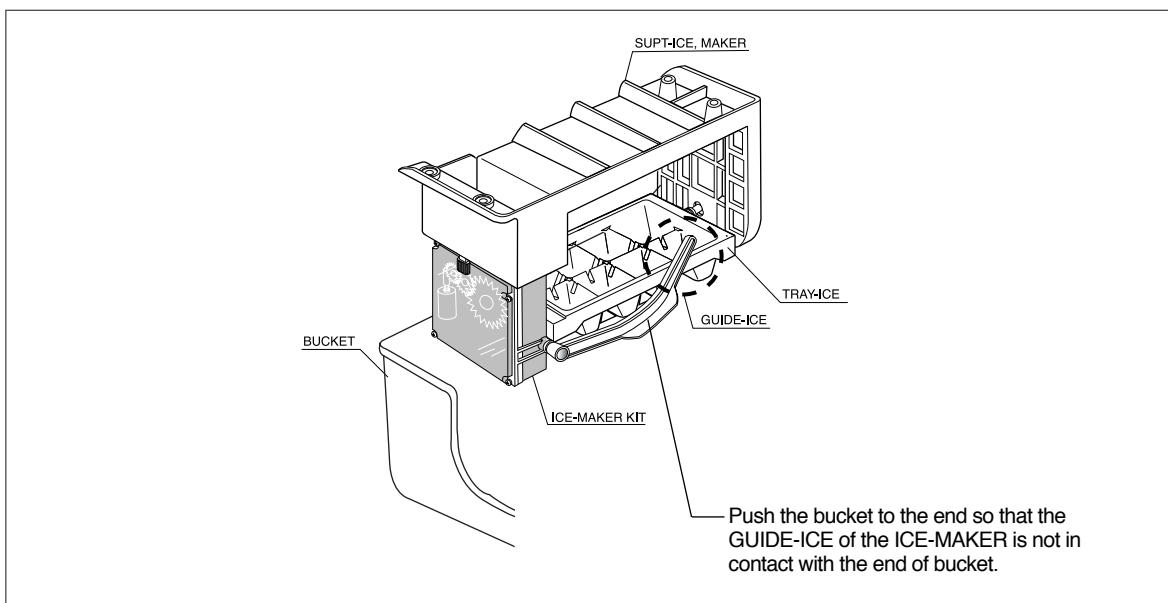
10-6) Disassembly of Ice Maker

1. Pull out the bucket from the freezer.

2. Disassemble the SUPT-ICE MAKER, which fixes the ice-maker, and the wire housing in the rear of the maker.

3. Disassemble by lifting the SUPT-ICE and FIXER-CASE in the front of the maker up (① direction) and pulling the ICE-MAKER KIT out to the front (② direction).(Do not disassemble each component of the ICE-MAKER KIT. Otherwise, the setting value may be changed.)
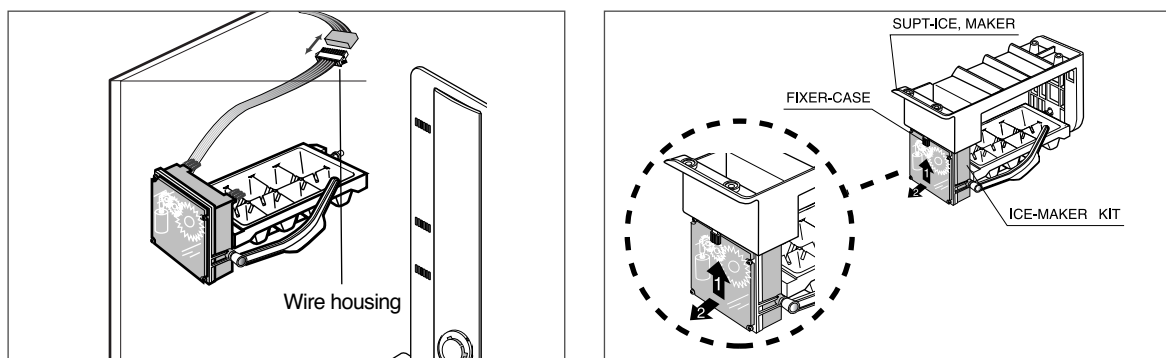
10-7) Assembly of Ice-Maker

1. Fit the rear rising of the ICE-MAKER KIT to the front slot of the TRAY ICE.

2. Lift FIXER-CASE at the front of the SUPT-ICE MAKER up. (① direction)

3. Place the top rising of the ICE-MAKER KIT to the slot of SUPT-ICE MAKER for insertion.

4. Push the front of the ICE-MAKER KIT while maintaining the position.
   (Be careful. If you overpush the ICE-MAKER KIT, the fixed rising of the SUPT-ICE MAKER may be damaged.)

5. When the front of the ICE-MAKER KIT is sagging, it means the assembly is not right. At that case, perform the assembly again.
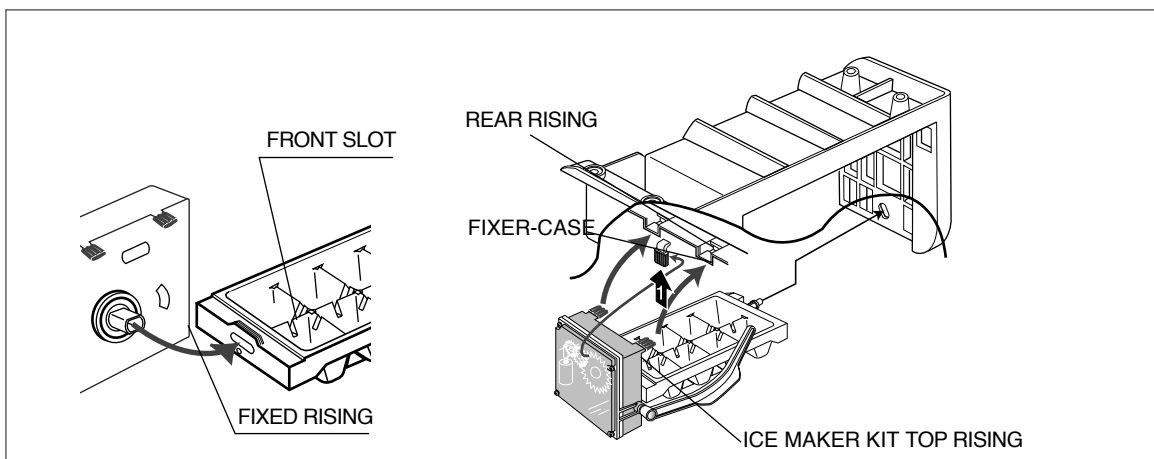
11. Reference

Reference No. 1) Electric Wire Assembly Cabinet-door Connection Drawing

Connected at HINGE-UP part of freezer

MAIN PCB ASS'Y

BLK ①	①	①	① BLK
BRN ②	②	②	② BRN
RED ③	③	③	③ RED
ORG ④	④	④	④ ORG
YEL ⑤	⑤	⑤	⑤ YEL
PNK ⑥	⑥	⑥	⑥ PNK
PRP ⑦	⑦	⑦	⑦ PRP
BLU ⑧	⑧	⑧	⑧ BLU
GRY ⑨	⑨	⑨	⑨ GRY
WHT ⑩	⑩	⑩	⑩ WHT
S/BLU ⑪	⑪	⑪	⑪ S/BLU
W/BLK ⑫	⑫	⑫	⑫ W/BLK
W/RED ⑬	⑬	⑬	⑬ W/RED
W/BLU ⑭	⑭	⑭	⑭ W/BLU

PANEL PCB ASS'Y
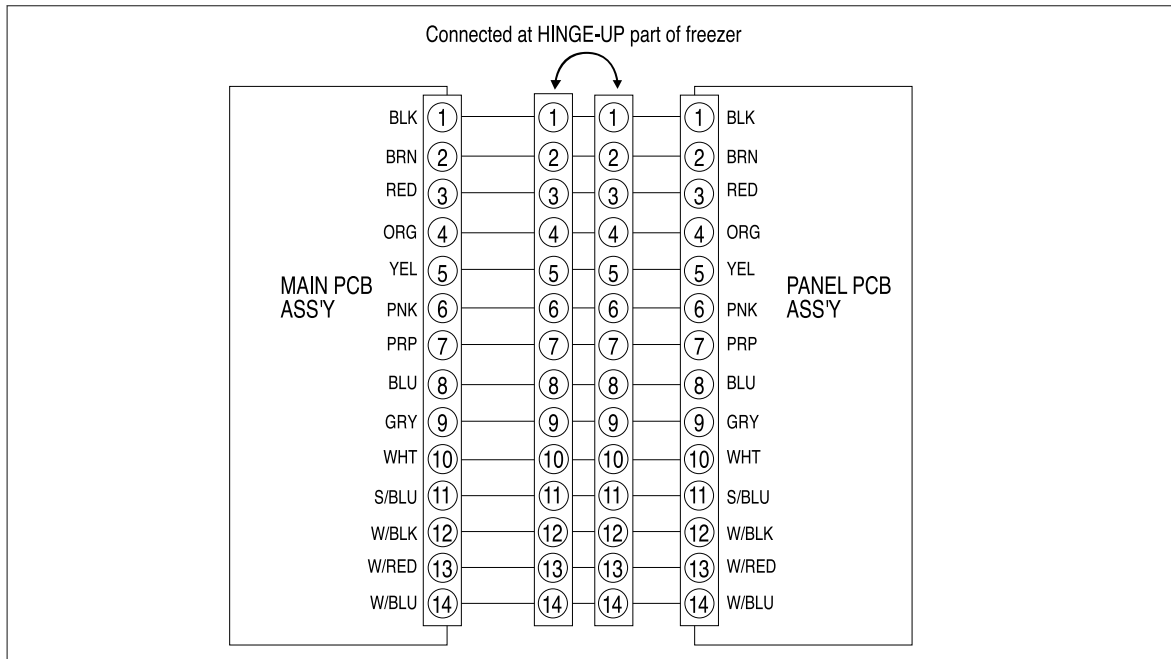
Reference No. 2) Test Method of Relay Defect

3 Contact Point   2 Contact Point   SSR Contact Point   PCB

NO
C
NC

CN70
CN71

Coil Terminal

Trigger Terminal

Checkup after separation

Coil Terminal
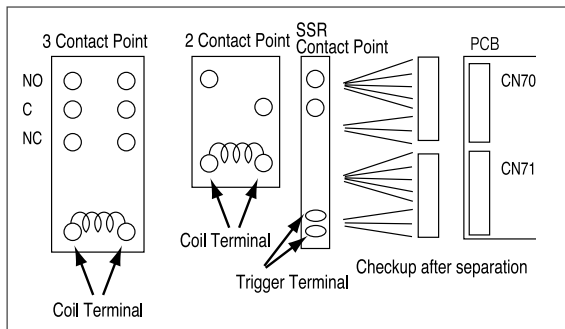
Note) NC → Normal Close(C Terminal and Common ON Terminal)
NO → Normal Open(C Terminal and Common OPEN Terminal)
C → Common Terminal

First, separate housing which is connected to load connection part(Main PCB CN70~CN71). Check the following items (Judge by voltage and resistance value).

1. Judge whether relay moves or not by measuring voltage of both coil terminals.
2. Judge whether SSR moves or not by measuring voltage of two trigger terminals.
3. Load contact point of two terminals are measured by resistance value. Whether there is fault or not is judged by comparing with voltage conditions of coil and trigger.

Contact Point Division	Coil and Trigger Two Terminal Voltage	Two Terminal	Contact Point	
3 Contact Point Relay	DC about 12V (Movement Condition)	Between C and NO	$0\,\Omega$ (SHORT)→ Normal	
		Between C and NC	$\infty\,\Omega$ (OPEN) →Normal	
	DC About 0V (Stop Condition)	Between C and NO	$\infty\,\Omega$ (OPEN) →Normal	
		Between C and NC	$0\,\Omega$ (SHORT)→ Normal	
2 Contact Point Relay	DC About 12V(Load Movement condition)	Contact Points Between Two terminals	$0\,\Omega$ (SHORT)→ Normal	
	DC About 12V(Load Stop Condition)	Contact Points Between Two terminals	$\infty\,\Omega$ (OPEN) → Normal	
SSR	DC About 12V(Load Movement condition)	Contact Points Between Two terminals	About $4\,k\Omega \sim 5\,k\Omega$(SHORT) →Normal	
	DC About 12V(Load Stop Condition)	Contact Points Between Two terminals	$\infty\,\Omega$ (OPEN) → Normal	

Note) SSR: Solid State Relay (No Contact Point Electric Type Relay)

Reference No. 3) Load Defect Checkup
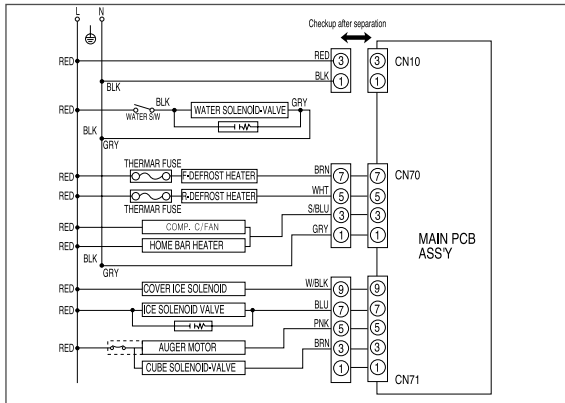
After separating power cord from power source plug socket, separate connectors CN10, 70, and 71 of the main PCB, and check the following items.

1. Measure load terminal and resistance value between terminals like the following to check whether there may exist defects of load and electric wire connection.

Load	Measure	Terminal	Fault Item	Remark
F-Defrost Heater	Between CN70 ⑦ and CN10③	0 Ω	Badness of temperature, fuse, heater, electric wire short-circuit	
		∞ Ω	Badness of temperature, fuse, heater, and electric wire disconnection	
R-Defrost Heater	Between CN71⑤ and CN10③	0 Ω	Badness of motor coil and wire short-circuit	
		∞ Ω	Badness of motor coil and wire short-circuit	
Ice Solenoid (Machine Room)	Between CN71 ⑦ and CN10③	0 Ω	Badness of coil and wire short-circuit	I/M Application Model
		∞ Ω	Badness of coil and wire short-circuit	
Cube Solenoid (F-Room Inside)	Between CN71 ⑦ and CN10③	0 Ω	Badness of coil and wire short-circuit	I/M Application Model
		∞ Ω	Badness of coil and wire short-circuit	
Cover Solenoid (F-Door)	Between CN71 ⑨ and CN10③	0 Ω	Badness of coil and wire short-circuit	I/M Application Model
		∞ Ω	Badness of coil and wire short-circuit	
AUGER MOTOR	Between CN71 ⑤ and CN10③	0 Ω	Badness of coil and wire short-circuit	I/M Application Model
		∞ Ω	Badness of coil and wire short-circuit	
HOME-BAR HEATER	Check resistance of the red and sky blue line of R-door side	0 Ω	Badness of heater wire short-circuit	H/B Application Model(check connectionterminal only after separation)
		∞ Ω	Badness of heater wire short-circuit	

Note) COMP parts can be changed by Capacitor, PTC, and Over Load Protector. Therefore, they are checked by existence of movement.

Reference No. 4) Fault Check Method of Various Sensors
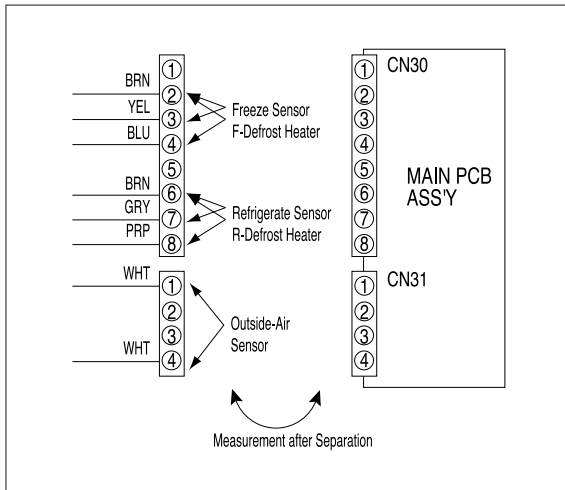
After separating connector from the MAIN-PCB, measure resistance of sensor forging, and judge fault existence.

1. Freezer Sensor CN 30, measure resistance value between and
2. Refrigerator Sensor CN30, measure resistance value between and
3. F-Defrost Sensor CN30, measure resistance value between and
4. R-Defrost Sensor CN30, measure resistance value between and
5. Outside Air Sensor CN31, measure resistance value between and
6. Compare above measurement value with temperature of location of each sensor. Also compare with sensor resistance and voltage conversion table about temperature of Ref. 8 of this manual. And judge whether there is any defect.

❊ At this time, when measuring ∞ Ω or 0 Ω, check wire assembly condition.

Reference No. 5) Check Door S/W Fault & Ice Lever S/W Check Method
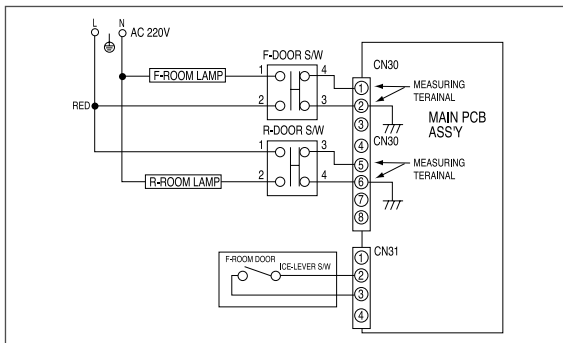
Check in state that power is applied. Door S/W is 2 contact-point circuit; one contact-point senses door open/close with DC 5V on PCB, and the other contact-point lets refrigerator inside lamp fluorescent On/Off.

(R-Room Lamp Part)
1. When refrigerator door is opened, check whether lamp is lit up or not. If it is normal, check whether lamp lights out or not when pressing DOOR S/W in the state that R-DOOR is open. If any faults are found, check DOOR S/W of R-ROOM door.

(MAIN-PCB Sensing Part for R-ROOM Door Open)
1. Check voltage by applying "+" terminal to CN30 and "-" terminal to .
2. When R-ROOM door is opened, if about DC 5V is measured, it is normal.
3. When R-ROOM door is closed, if about DC 0V is measured, it is normal. If any faults are found, check DOOR S/W and wire connection system.

(F-Room Lamp Part)
1. When freezer door is opened, check whether lamp is lit up or not. If it is normal, check whether lamp lights out or not when pressing door S/W in the state that F-DOOR is open. If any faults are found, check door S/W of F-ROOM door.

(MAIN-PCB Sensing Part for F-ROOM Door Open)
1. Check voltage by applying "+" terminal to CN30 and "-" terminal to .
2. When F-ROOM door is opened, if about DC 5V is measured, it is normal.
3. When F-ROOM door is closed, if about DC 0V is measured, it is normal. If any faults are found, check DOOR S/W and wire connection system.

(Ice Eject Lever)
1. In case ice is not ejected though ice eject lever which is installed at the front part of freezer, check like the following.
2. First, check fault existence of F-ROOM DOOR S/W. If no defect is found, separate CN31 connector on the MAIN-PCB. Apply "+" terminal to and "-" terminal to, and check resistance. Check it becomes 0 Ω when ICE LEVER S/W was pressed. When it is always ∞ regardless of ON/Off of S/W, check wire system and connection system.

Reference No. 6) Resistance of Sensor about Temp. & Voltage Conversion Table

Voltage inputted to Micom Port differs according to H/W structure. This specification is standardized one by voltage which is applied at the time when 10㏀-F grade of partial pressure resistance is used.
Corresponding Micom Port Voltage Specifications when Sensor is Open : DC about 5V(Vcc Level)Corresponding MicomPort Voltage Specifications when Sensor Short : DC about 0V(Ground Level)

Temperature(°C)	Resistance (KΩ)	Voltage (V)	Temperature(°C)	Resistance (KΩ)	Voltage (V)	Temperature(°C)	Resistance (KΩ)	Voltage (V)
-35	68.648	4.364	-12	21.814	3.428	11	8.345	2.274
-34	65.011	4.333	-11	20.848	3.397	12	8.032	2.227
-33	61.595	4.301	-10	19.932	3.329	13	7.732	2.180
-32	58.384	4.268	-09	19.062	3.279	14	7.446	2.134
-31	55.366	4.235	-08	18.237	3.229	15	7.172	2.088
-30	52.526	4.2	-07	17.453	3.178	16	6.910	2.043
-29	49.854	4.164	-06	16.709	3.127	17	6.659	1.998
-28	47.337	4.127	-05	16.001	3.076	18	6.420	1.954
-27	44.967	4.09	-04	15.328	3.025	19	6.190	1.911
-26	42.733	4.051	-03	14.688	2.974	20	5.970	1.869
-25	40.626	4.012	-02	14.080	2.923	21	5.759	1.827
-24	38.640	3.972	-01	14.501	2.872	22	5.557	1.786
-23	36.765	3.93	00	12.949	2.821	23	5.363	1.745
-22	34.995	3.888	01	12.424	2.77	24	5.178	1.705
-21	33.323	3.845	02	11.924	2.719	25	5.000	1.666
-20	31.743	3.802	03	11.447	2.668	26	4.829	1.628
-19	30.250	3.757	04	10.993	2.618	27	4.665	1.590
-18	28.838	3.712	05	10.559	2.567	28	4.508	1.553
-17	27.502	3.666	06	10.146	2.518	29	4.357	1.517
-16	26.237	3.62	07	9.752	2.468	30	4.212	1.481
-15	25.040	3.573	08	9.375	2.419	31	4.072	1.446
-14	23.906	3.525	09	9.016	2.37	32	3.938	1.412
-13	22.832	3.477	10	8.673	2.322	33	3.810	1.379

Reference No. 7) Forced Operation and Defrost Input Method

(Forced Operation)

It is a function to operate COMP and F-fan immediately regardless of freezer temperature.

1. When pressing Quick Freeze S/W and Cold room Temperature Control S/W on the Panel together more than 8sec., all displays become Off. And, four temperature corresponding S/W(Quick Freeze, Vacation, Freezer Temperature Control, Refrigerator Temperature Control) operate by test button.
2. In the above state, when pressing any one among four control S/W once, forced operation starts.

(Forced Defrost)

It is a function to make R defrost or R and F defrost at a time regardless of defrost time.

1. In state of forced driving, when pressing the S/W once, R room alone is defrosted. And, if pressing it once more, simultaneous defrost of R and F is performed.: Buzzer sound occurs at forced defrost, too.
2. After making Power Off and let it be On again, cancellation is made.

Reference No. 8) Circuit Par Service Material List

<Eject Motor Check>
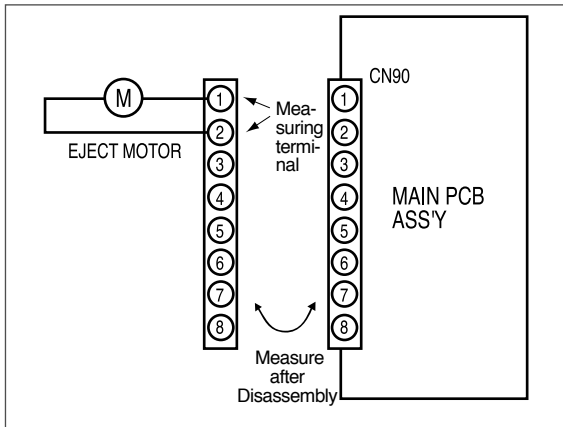
Check Method for Motor when EJECT MOTOR does not operate.

1. Disconnect CN90 from MAIN PCB.
2. Check the resistance value between ① and ② of CN90, connector, of Load Terminals.
3. If the resistance value is between 18 and 22 Ω, it is normal.
4. If the value is 0 Ω, it is SHORT fault. Check the wire connection state and Motor.
5. If the value is ∞ Ω, it is OPEN type and check the wire connection line.

<TEST Operation method>
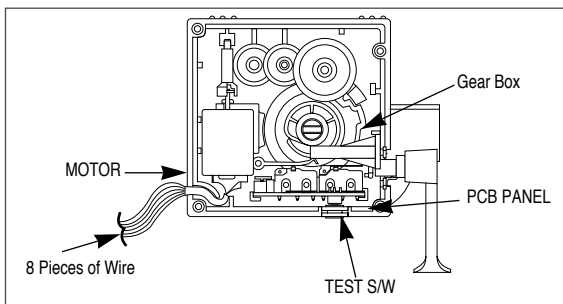
This is for check whether the Motor operates normally and whether water is normally supplied.

1. When S/W in the KIT inside the Freezer is pushed, TEST operation will starts. More detailed instruction of Test operation, refer to the section of the ICE-MAKER TEST functions.

Reference No. 9) Circuit Part Service Material List

NO	CODE-NO	Product Name	Specification	Quantity	Remark
1	DA41-00024A	MAIN PCB ASS'Y	-	1	Basic Type
2	DA41-00027A		-	1	Ice & Water Disp Type
3	DA41-00020A	PANEL PCB ASS'Y	-	1	Basic Type
4	DA41-00020B		-	1	Ice & Water Disp Type
5	DA32-10105H	F, R ROOM SENSOR	502AT(100mm)	2	Common Use
6	DA32-10109Q	Outside Air Sensor	502AT(2,615mm)	1	Common Use
7	DA32-10109R	F-EVA. SENSOR	502AT(540mm)	1	Common Use
8	DA32-10109N	R-EVA. SENSOR	502AT(370mm)	1	Common Use
9	DA27-00002A	NOISE FILTER	CAN TYPE	1	Common Use
10	3301-000016	FERRITE CORE	BNF-18	1	Common Use

12-4) Temperature Control Part

SR-S2026, S2027, S2226, S2227
Basic & with Home-Bar type

Projection Jaw

Housing

Cover control Rear

PCB

Transparent Window

Cover control Front
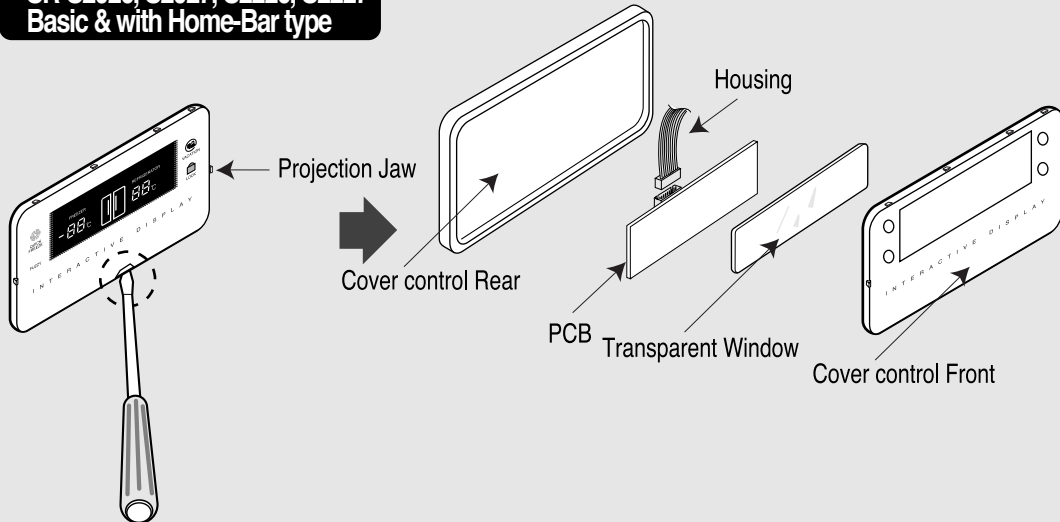
SR-S2028, S2029, S2228, S2229
Dispenser & with Home-Bar type

Housing

Cover control Rear

PCB

Transparent Window

Cover control Front
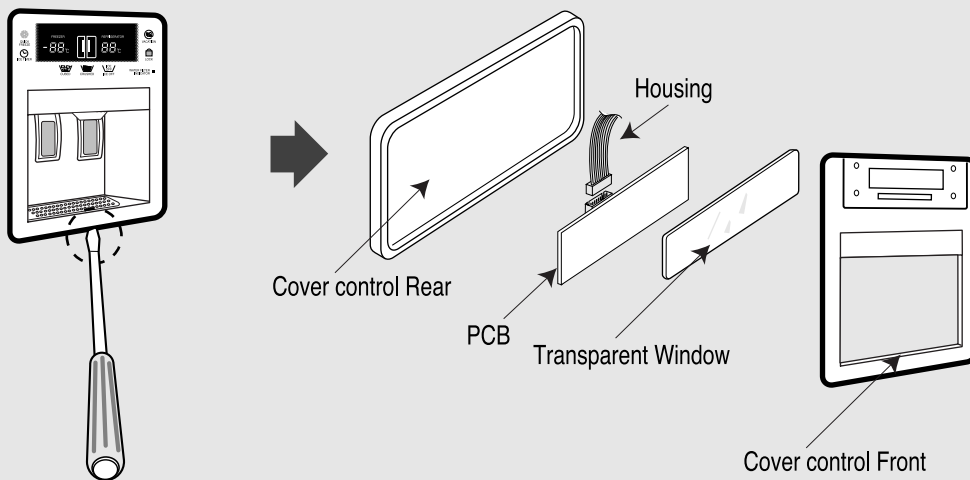
● Disassemble the projection jaw using a ⊝ screwdriver to the groove of lower part of Control Front Cover.

● Disassemble wire housing connected to PCB. Disassemble PCB plate at the projection jaw.
● Assembly is done by reverse order of disassembly.

13. Method of HINGE-UP Assembly & Disassembly

1. HINGE-UP ASS'Y Structure

FIXER-HINGE, UP

HINGE-UP ASS'Y

EXT-SENSOR

EARTH LINE

REINF-HINGE, UP

HINGE-UP ASS'Y

REINF-HINGE, UP

FIXER-HINGE, UP
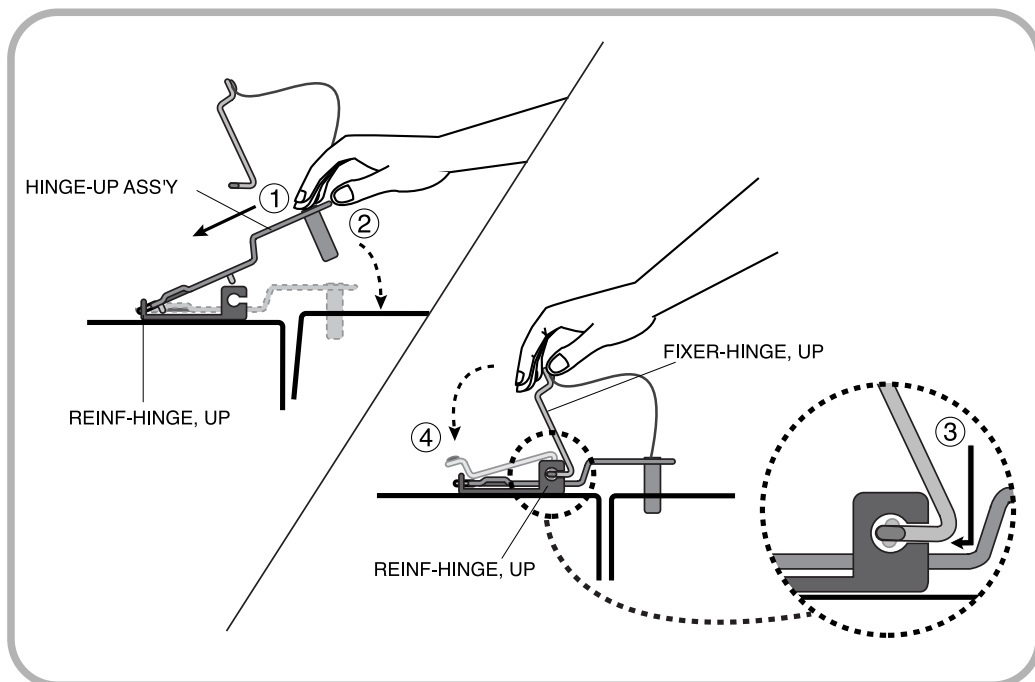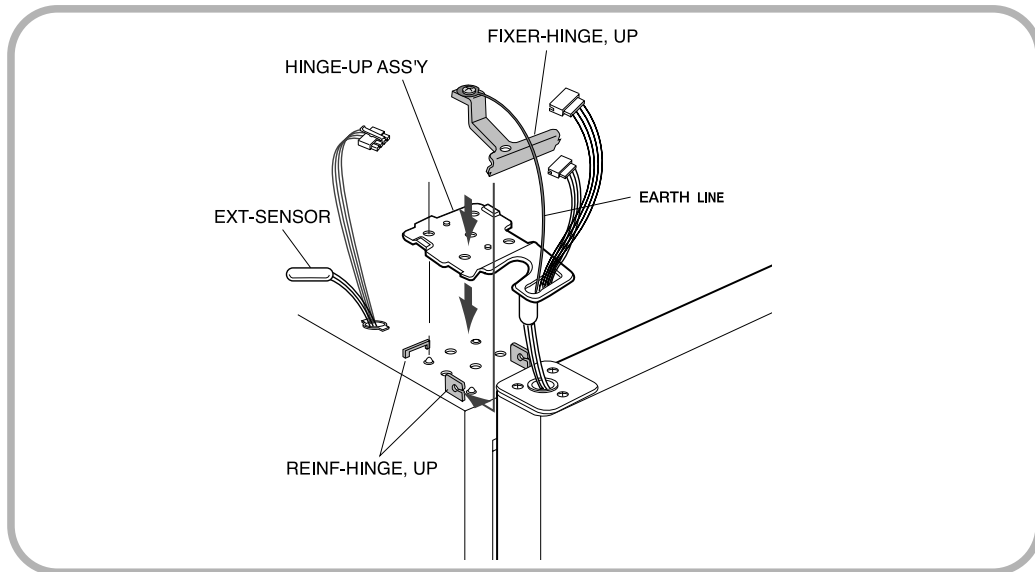
REINF-HINGE, UP

2. HINGE-UP ASS'Y Method
1)After inserting HINGE-UP ASS'Y to REINF-HINGE UP in the direction, combine it by rotating it in the direction.
2)After inserting FIXER-HINGE UP to REINF-HINGE UP in the direction, assemble it by rotating it in the direction.

3. HINGE-UP ASS'Y Disassembly Method
• Disassemble it in reverse order of assembly method.

15. Machine Room Assembly Specification

15-1) Please remove fixed screw of cover of machine room of Refrigerator rear low part.

15-2) Machine Room Assembly Specification

Electric Field Box

Condensing Unit

Cooling Fan

Compressor

Dryer
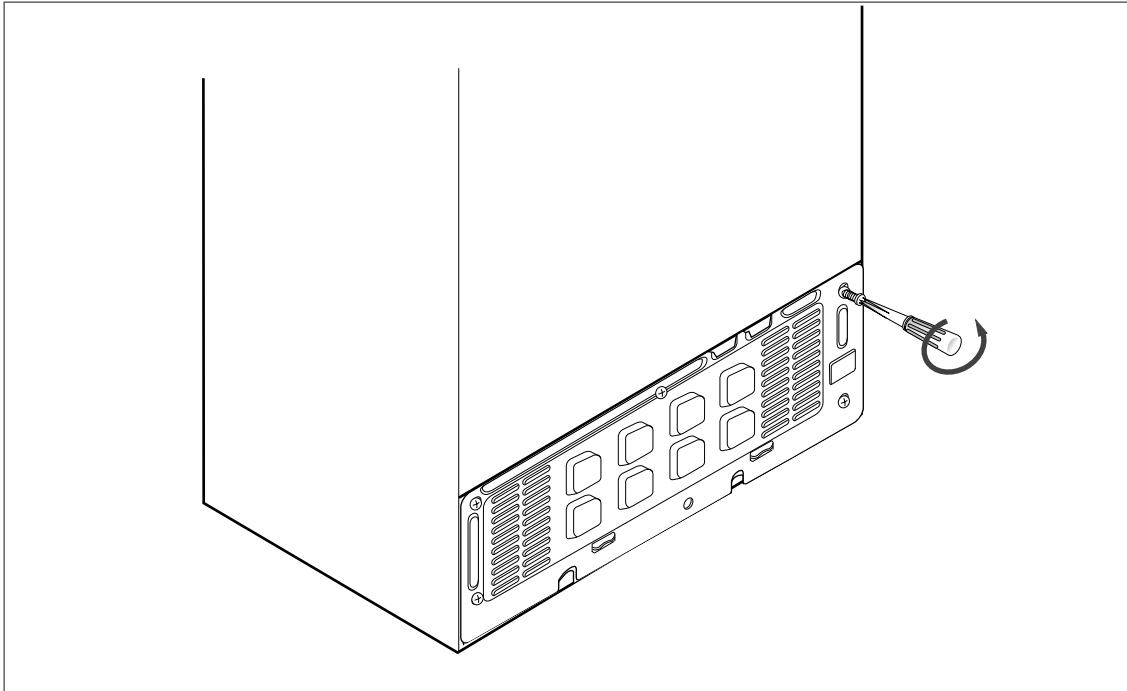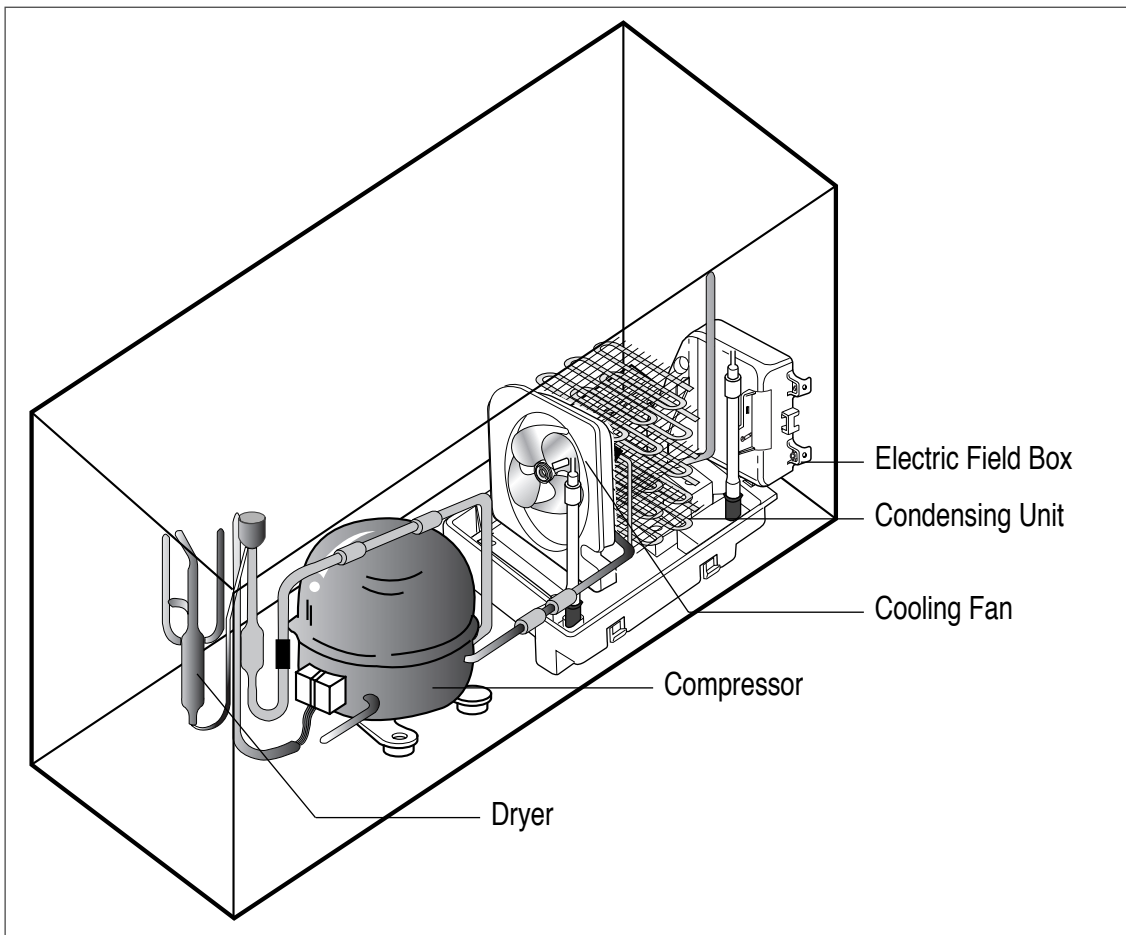
16. Disassembly & Assembly Method of Internal Part of Electric Field Box

15-1) Please cut-off the power supply of refrigerator.
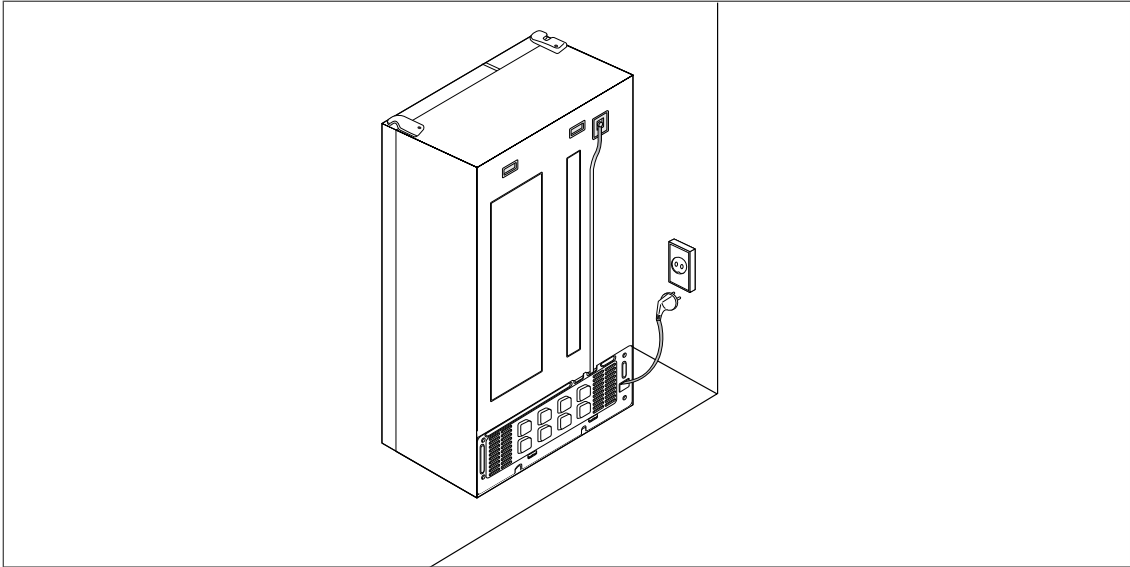
15-2) Please deviate cover of electric field box using driver.

(+) driver

(-) driver
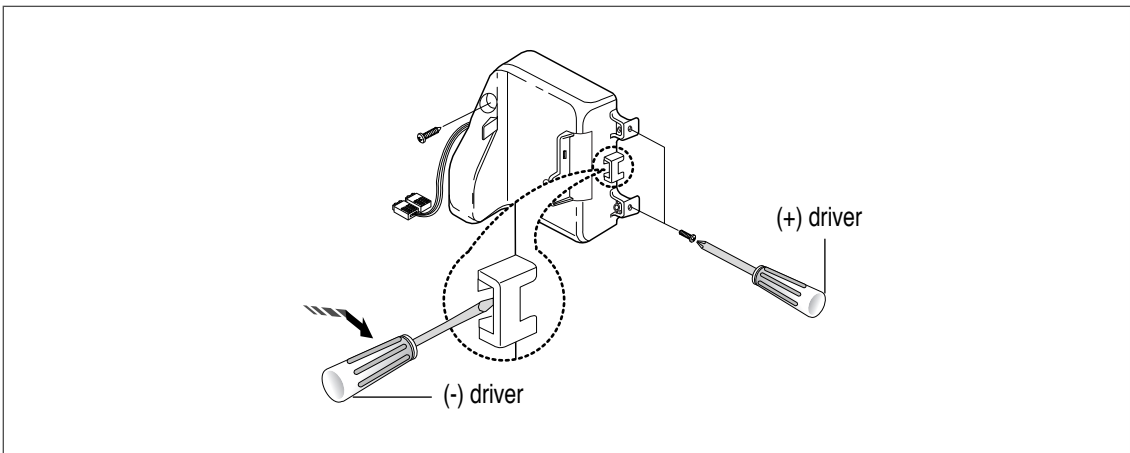
15-3) Assembly Specification of Electric Field Box

C-OIL

PCB-MAIN ASSY
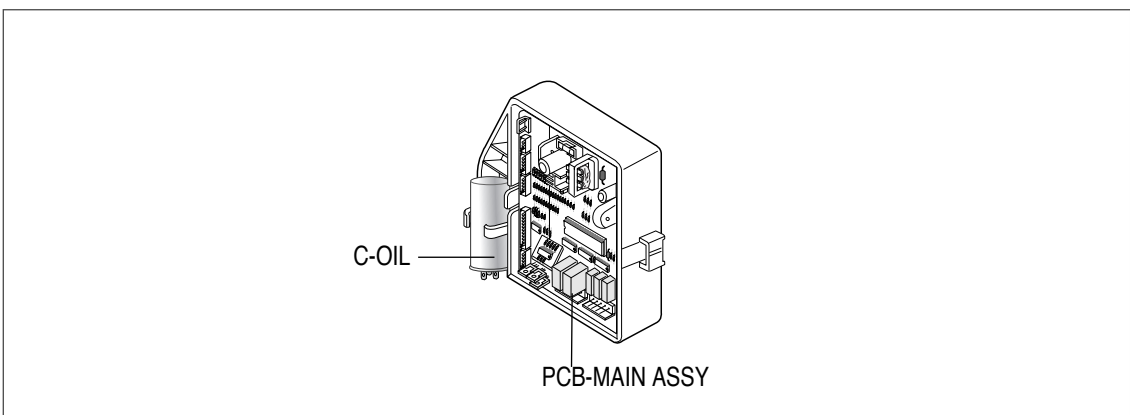
20-1) REGULATOR

3-TERMINAL 1A POSITIVE VOLTAGE REGULATORS

The KA78XX series of three-terminal positive regulators are available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

TO-220
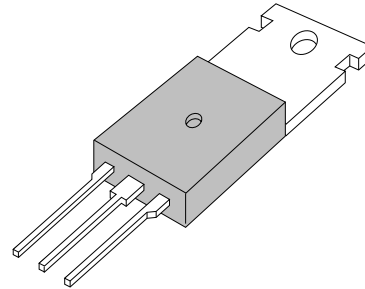
1:Input   2:GND   3:Output

■FEATURES

• Output Current up to 1A
• Output Voltages of 5; 6; 8; 9; 10; 11; 12; 15; 18; 24V
• Thermal Overload Protection
• Short Circuit Protection
• Output Transistor SOA Protection

■ORDERING INFORMATION

Device	Package	Operating Temperature
KA78XX	TO-220	0 ~ +125˚C
KA78XXA	TO-220	
KA78XXI	TO-220	-40 ~ +125˚C

■BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Characteristic	Symbol	Value	Unit
Input Voltage (for Vo = 5V to 18V)	V_I	35	V
(for Vo = 24V)	V_I	40	V
Thermal Resistance Junction-Cases	$R_{\theta JC}$	5	°C/W
Thermal Resistance Junction-Air	$R_{\theta JA}$	65	°C/W
Operating Junction Temperature Range KA78XX/A	T_{OPR}	0 ~ +125	°C
KA78XXI		-40 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

ELECTRICAL CHARACTERISTICS KA7805/I

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, I_o = 500mA, V_I = 10V, C_I = 0.33μF, C_o = 0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions		KA78051			KA7805			Unit
				Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_o	T_J = 25°C		4.8	5.0	5.2	4.8	5.0	5.2	V
		5.0mA ≤ 1.0A, P_o ≤ 15W								
		V_I = 7V to 20V					4.75	5.0	5.25	
		V_I = 8V to 20V		4.75	5.0	5.25				
Line Regulation	$\triangle V_o$	T_J = 25°C	V_I = 7V to 25V		4.0	100		4.0	100	mV
			V_I = 8V to 12V		1.6	50		1.6	50	
Load Regulation	$\triangle V_o$	T_J = 25°C	I_o = 0.5mA to 1.5A		9	100		9	100	mV
			I_o = 250mA to 750mA		4	50		4	50	
Quiescent Current	I_Q	T_J = 25°C			5.0	8		5.0	8	mA
Quiescent Current Change	$\triangle I_Q$	I_o = 5mA to 1.0A			0.03	0.5		0.03	0.5	mA
		V_I = 7V to 25V						0.3	1.3	
		V_I = 8V to 25V			0.3	1.3				
Output Voltage Drift	$\triangle V_o/\triangle T$	I_o = 5mA			-0.8			-0.8		mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100KHz T_A = 25°C			42			42		μV
Ripple Rejection	RR	f = 120Hz V_I = 8 to 18V		62	73		62	73		dB
Dropout Voltage	V_o	I_o = 1A, T_J = 25°C			2			2		V
Output Resistance	R_o	f = 1KHz			15			15		mΩ
Short Circuit Current	I_{SC}	V_I = 35V, T_A = 25°C			230			230		mA
Peak Current	I_{PK}	T_J = 25°C			2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

KA78XXI : T_{MIN} = -40°C, T_{MAX} = 125°C

KA78XX, T_{MIN} = 0°C, T_{MAX} = 125°C

* Load and line regulation are specified at constant junction temperature.

Changes in Vo due to heating effects must be taken into account separately.

Pulse testing with low duty is used.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Characteristic	Symbol	Value	Unit
Input Voltage (for Vo = 5V to 18V)	V_I	35	V
(for Vo = 24V)	V_I	40	V
Thermal Resistance Junction-Cases	$R_{\theta JC}$	5	°C/W
Thermal Resistance Junction-Air	$R_{\theta JA}$	65	°C/W
Operating Junction Temperature Range KA78XX/A	T_{OPR}	0 ~ +125	°C
KA78XXI		-40 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

ELECTRICAL CHARACTERISTICS KA7805/I

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, I_O = 500mA, V_I = 10V, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions		KA78051			KA7805			Unit
				Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_o	T_J = 25°C		4.8	5.0	5.2	4.8	5.0	5.2	V_o
		5.0mA ≤ 1.0A, P_o ≤ 15W V_I = 7V to 20V					4.75	5.0	5.25	
		V_I = 8V to 20V		4.75	5.0	5.25				
Line Regulation	$\triangle V_o$	T_J = 25°C	V_I = 7V to 25V		4.0	100		4.0	100	$\triangle V_o$
			V_I = 8V to 12V		1.6	50		1.6	50	
Load Regulation	$\triangle V_o$	T_J = 25°C	I_o = 0.5mA to 1.5A		9	100		9	100	$\triangle V_o$
			I_o = 250mA to 750mA		4	50		4	50	
Quiescent Current	I_Q	T_J = 25°C			5.0	8		5.0	8	I_Q
Quiescent Current Change	$\triangle I_Q$	I_o = 5mA to 1.0A			0.03	0.5		0.03	0.5	$\triangle I_Q$
		V_I = 7V to 25V						0.3	1.3	
		V_I = 8V to 25V			0.3	1.3				
Output Voltage Drift	$\triangle V_o/\triangle T$	I_o = 5mA			-0.8			-0.8		$\triangle V_o/\triangle T$
Output Noise Voltage	V_N	f = 10Hz to 100KHz T_A = 25°C			42			42		V_N
Ripple Rejection	RR	f = 120Hz V_I = 8 to 18V		62	73		62	73		RR
Dropout Voltage	V_o	I_o = 1A, T_J = 25°C			2			2		V_o
Output Resistance	R_o	f = 1KHz			15			15		R_o
Short Circuit Current	I_{SC}	V_I = 35V, T_A = 25°C			230			230		I_{SC}
Peak Current	V_{PK}	T_J = 25°C			2.2			2.2		V_{PK}

* $T_{MIN} < T_J < T_{MAX}$

KA78XXI : T_{MIN} = -40°C, T_{MAX} = 125°C

KA78XX, T_{MIN} = 0°C, T_{MAX} = 125°C

* Load and line regulation are specified at constant junction temperature.

Changes in V_o due to heating effects must be taken into account separately.

Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS KA7812/I

(Refer to test circuit, $T_{MIN} < T_J < T_{MAX}$, $I_O = 500mA$, $V_I = 19V$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, unless otherwise specified)

Characteristic	Symbol	Test Conditions		KA7812I			KA7812I			Unit
				Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_o	$T_J = 25°C$		11.5	12	12.5	11.5	12	12.5	V
		$5.0mA \le 1.0A$, $P_D \le 15W$								
		$V_I = 14.5V$ to $27V$					11.4	12	12.6	
		$V_I = 15.5V$ to $27V$		11.4	12	12.6				
Line Regulation	$\triangle V_o$	$T_J = 25°C$	$V_I = 14.5$ to $30V$		10	240		10	240	mV
			$V_I = 16$ to $22V$		3.0	120		3.0	120	
Load Regulation	$\triangle V_o$	$T_J = 25°C$	$I_o = 5mA$ to $1.5A$		11	240		11	240	mV
			$I_o = 250mA$ to $750mA$		5.0	120		5.0	120	
Quiescent Current	I_Q	$T_J = 25°C$			5.1	8		5.1	8	mA
Quiescent Current Change	$\triangle I_Q$	$I_o = 5mA$ to $1.0A$			0.1	0.5		0.1	0.5	mA
		$V_I = 14.5V$ to $30V$						0.5	1.0	
		$V_I = 15V$ to $30V$			0.5	1.0				
Output Voltage Drift	$\triangle V_o/\triangle T$	$I_o = 5mA$			-1			-1		mV/°C
Output Noise Voltage	V_N	$f = 10Hz$ to $100KHz$,$T_A = 25°C$			76			76		μV
Ripple Rejection	RR	$f = 120Hz$ $V_I = 15V$ to $25V$		55	71		55	71		dB
Dropout Voltage	V_o	$I_o = 1A$, $T_J = 25°C$			2			2		V
Output Resistance	R_o	$f = 1KHz$			18			18		$m\Omega$
Short Circuit Current	I_{SC}	$V_I = 35V$, $T_A = 25°C$			230			230		mA
Peak Current	V_{PK}	$T_J = 25°C$			2.2			2.2		A

* $T_{MIN} < T_J < T_{MAX}$

  KA78XXI : $T_{MIN} = -40°C$, $T_{MAX} = 125°C$

  KA78XX, $T_{MIN} = 0°C$, $T_{MAX} = 125°C$

* Load and line regulation are specified at constant junction temperature.

  Changes in V_o due to heating effects must be taken into account separately.

  Pulse testing with low duty is used.

3.3V VOLTAGE DETECTOR

The KA7533 prevents error of system from supply voltage below normal voltage level at the time the power on and instantane ous power off in systems.

TO-92

■FEATURES

• Detecting against error operations at the power ON/OFF.
• Resetting function for the low voltage microprocessor.
• Checking low battery.
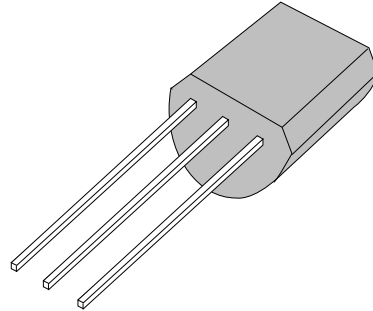
1:Input   2:GND   3:Output

■ORDERING INFORMATION

Device	Package	Operating Temperature
KA7533Z	TO-92	-30 ~ +75°C

■BLOCK DIAGRAM

V_{CC}
(INPUT)

V_O

V_{REF}

GND
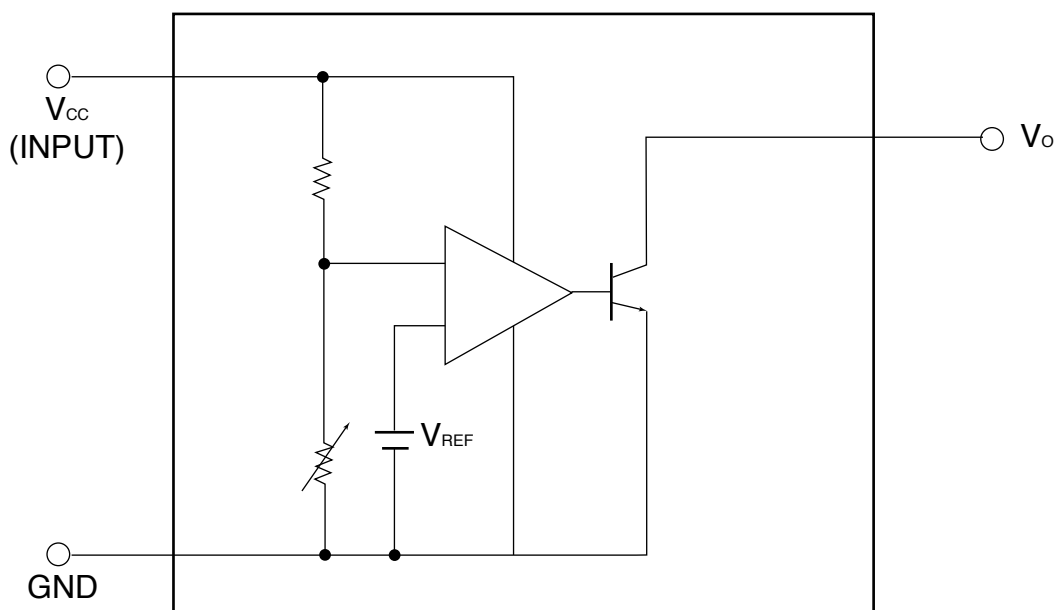
■ABSOLUTE MAXIMUM RATING (T$_A$ = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V$_{CC}$	-0.3 ~ +15.0	V
Detecting Voltage	V$_{DET}$	3.3	V
Hysteresis Voltage	R$_{HYS}$	50	mV
Operating Temperature	T$_{OPR}$	-30 ~ +75	°C
Storage Temperature	T$_{STG}$	-50 ~ +150	°C
Power Dissipation	P$_D$	200	mW
Detecting Voltage Temperature Coefficient	$\triangle$V$_{DET}$/$\triangle$T	$\pm$ 0.01	%/°C

■ELECTRICAL CHARACTERISTICS (T$_A$ = 25°C)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Detecting Voltage	V$_{DET}$	R$_L$ = 200 Ω , V$_{OL}$ $\leq$ 0.4V	3.15	3.3	3.45	V
Low Output Voltage	V$_{OL}$	R$_L$ = 200 Ω	-	-	0.25	V
Output Leakage Current	I$_{LKG}$	V$_{CC}$ = 15V	-	-	0.1	μV
Hystersis Voltage	V$_{HYS}$	R$_L$ = 200 Ω	30	50	100	mV
Detecting Voltage Temperature Coefficient	$\triangle$V$_{DET}$/$\triangle$T	R$_L$ = 200 Ω		$\pm$ 0.1		%/°C
Circuit Current (at on time)	I$_{CCL}$	V$_{CC}$ = V$_{DET(MIN)}$-0.05V	-	300	500	μA
Circuit Current (at off time)	I$_{CCH}$	V$_{CC}$ = 5.25V	-	30	50	μA
Threshold Operating Voltage	V$_{TH(OPR)}$	R$_L$ = 200 Ω , V$_{OL}$ $\leq$ 0.4V	0.6	0.8	1.0	V
"L" Transmission Delay Time	T$_{DL}$	R$_L$ = 1.0 KΩ , C$_L$ = 100pF	-	10	15	μS
"H" Transmission Delay Time	T$_{DM}$	R$_L$ = 1.0 KΩ , C$_L$ = 100pF	-	15	20	μS
Output Current (at on time Ⅰ)	T$_{OL}$ Ⅰ	V$_{CC}$ = V$_{DET(MIN)}$ - 0.05V, T$_C$ = 25°C	10	18	28	mA
Output Current (at on time Ⅱ)	T$_{OL}$ Ⅱ	V$_{CC}$ = V$_{DET(MIN)}$ - 0.05V, T$_C$ = -30 ~ +75°C	8	16	30	mA

20-3) DRIVER IC (KID65783AP)

KEC — KOREA ELECTRONICS CO.,LTD.

SEMICONDUCTOR TECHNICAL DATA

KID65783AP/AF
BIPOLAR LINEAR INTEGRATED CIRCUIT

8CH HIGH-VOLTAGE SOURCE DRIVER

The KID65783AP/AF is comprised of eight source current transistor array.
This driver is specifically designed for fluorescent display applications.
Applications include relay, hammer and lamp drivers.

FEATURES
- High Output Voltage : Vcc=50V(Min.).
- Output Current (Single Output) I_{OUT} : -500mA(MIN)
- Output Clamp Diodes.
- Single Supply Voltage.
- Input Compatible With Various Types of Logic.
- Package Type-AP : DIP-18pin.
- Package Type AF : FLP-18pin.

TYPE	DESIGNATION
KID65783AP/AF	TTL, 5V CMOS

MAXIMUM RATINGS (Ta=25°C

CHARACTIC	SYMBOL		RATING	UNIT
Supply Voltage	V_{CC}		50	V
Output Current	I_{OUT}		-500	mA/ch
Input Voltage	V_{IN}		15	V
Clamp Diode Reverse Voltage	V_R		50	V
Clamp Diode Forward Current	I_F		500	mA
Power Dissipation	AP	P_D (Note)	1.47	W
	AF		0.96	
Operating Temperature	T_{OPT}		-40~85	°C
Storage Temperature	T_{STG}		-55~150	°C

■ PIN CONNEASTION (TOP VIEW)
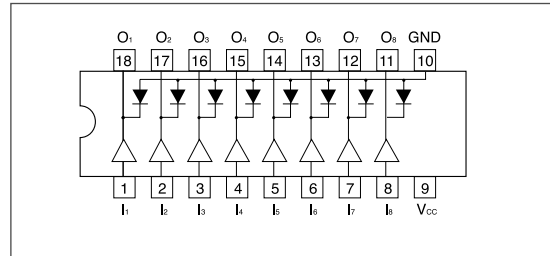
■ SCHEMATICS (EACH DRIVER)
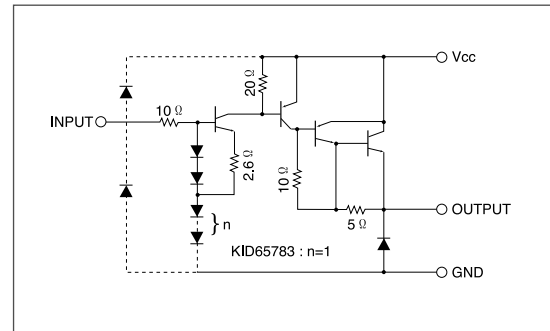
(Note) The input and output parasitic diodes cannot be used as clamp diodes.

■ ELECTRICAL CHARACTERISTICS(Ta=25°C,Vcc=5V)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Leakage Curret	I_{CEX}	1	Vcc=Vcc MAX. VIN=0.4V Ta=25°C	-	-	100	μA
Output Saturation Voltage	$V_{CE}(sat)$	2	VIN=VIN(ON), IOUT=-350mA	-	-	2.0	V
			VIN=VIN(ON), IOUT=-225mA	-	-	1.9	
			VIN=VIN(ON), IOUT=-100mA	-	-	1.8	
Input Current	$I_{IN}(ON)$	3	VIN=2.4V	-	36	52	μA
			VIN=3.85V	-	180	260	
Input Voltage	$I_{IN}(ON)$	4	VCE=2.0V, IOUT=1350mA	-	-	2.0	V
	$I_{IN}(OFF)$		IOUT=-500 μA	0.8	-	-	
Supply Current	$I_{IN}(ON)$	3	VIN=VIN(ON), VCC=50V	-	-	2.5	mA/ch
Clamp Diode Reverse Current	I_R	5	VR=50V	-	-	50	μA
Clamp Diode Forward Voltage	V_F	6	IF=350mA	-	-	2.0	V
Turn-On Delay	t_{ON}	7	VCC=Vcc MAX. RL=125Ω CL=15PF	-	0.15	-	μs
Turn-Off Delay	t_{OFF}			-	1.8	-	

2001 THRU 2024

HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

ULN20XXL

ULN20XXA

Dwg. No. A-9594

Ideally suited for interfacing between low-level logic circuitry and multiple peripheral power loads, the Series ULN2000A/L high-voltage, high-current Darlington arrays feature continuous load current ratings to 600 mA for each of the seven drivers. At an appropriate duty cycle depending on ambient temperature and number of drivers turned ON simultaneously, typical power loads totaling over 260W(400mA × 7, 95V) can be controlled. Typical loads include relays, solenoids, stepping motors, magnetic print hammers, multiplexed LED and incandescent displays, and heaters. All devices feature open collector outputs with integral clamp diodes.

The ULN2001A device is a general-purpose array that may be used with external input current limiting, or with most PMOS or CMOS logic directly.

The Series ULN20 × 3A/L has series input resistors selected for operation directly with 5V TTL or CMOS. These devices will handle numerous interface needs-particularly those beyond the capabilities of standard logic buffers.

The Series ULN20 × 4A/L features series input resistors for operation directly from 6 to 15V CMOS or PMOS logic outputs.

The Series ULN200 × A/L is the standard Darlington array. The outputs are capable of sinking 500mA and will withstand at least 50V in the OFF state. Outputs may be paralleled for higher load current capability. The ULN2013A device is similar except that it will sink 600mA. The Series ULN202 × A/L will withstand 95V in the OFF state.

These Darlington arrays are furnished in 16-pin dual in-line plastic packages (suffix A) and 16-lead surface-mountable SOICs (suffix L). All devices are pinned with outputs opposite inputs to facilitate ease of circuit board layout.

■ FEATURES

- TTL, DTL, PMOS, or CMOS Compatible inputs
- Output Current to 600mA
- Output Voltage to 95V
- Transient-Protected Outputs
- Dual In-Line Plastic Package or Small-Outline IC Package

ABSOLUTE MAXIMUM RATINGS

Output Voltage, V_{CE}
(ULN200X*, ULN2013A) **50V**
(ULN202X*) **95V**
Input Voltage V_{IN} **30V**
Continuous Output Current, I_C
(ULN200X*, ULN202X*) ... **500mA**
(ULN2013A) **600mA**
Continuous Input Current, I_{IN}... **25mA**
Power Dissipation, P_D
(one Darlington pair) **1.0W**
(total package) .... **See Graph**
Operating Temperature Range,
T_A .... **-20°C to +85°C**
Storage Temperature Range,
T_S .... **-55°C to +150°C**

Note that the ULN2000A Series (dual in-line package) and ULN2000L series (small-outline IC package) are electrically identical and share a common pin number assignment.

x = digit to identify specific device. Characteristic shown applies to family of devices with remaining digits as shown. See matrix on next page.

2001THRU 2024
HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS
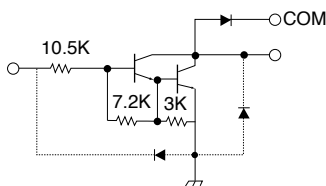
PARTIAL SCHEMATICS

ULN2001A (Each Driver)
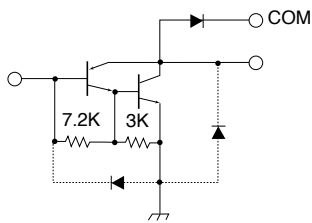
Dwg. No. A-9595

ULN20X3A/L (Each Driver)
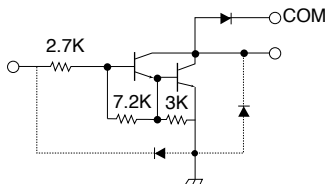
Dwg. No. A-9651

ULN20X4A/L (Each Driver)
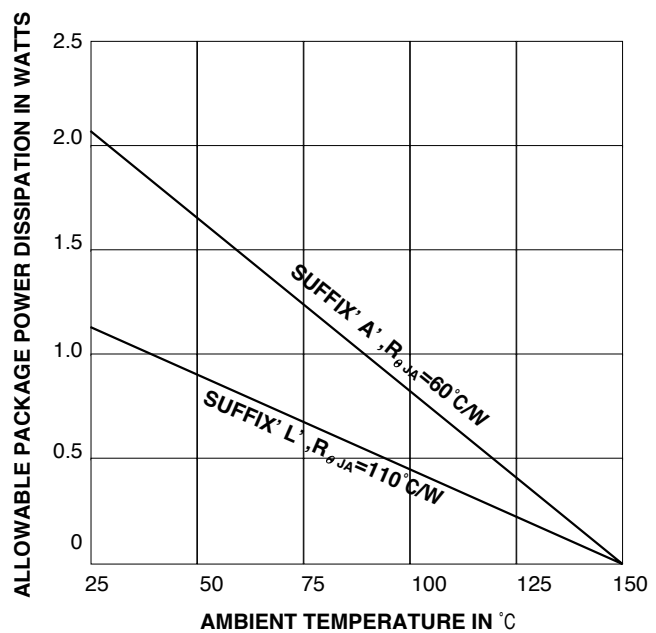

Dwg. No. A-9898A

■ DEVICE NUMBER DESIGNATION

$V_{CE(MAX)}$	50V	50V	95V
$I_{C(MAX)}$	500mA	600mA	500mA

Logic	Part Number		
General Purpose PMOS, CMOS	ULN2001A*	-	-
5V TTL, CMOS	ULN2003A* ULN2003L*	ULN2013A*	ULN2023A* ULN2023L
6-15V CMOS, PMOS	ULN2004A* ULN2004L*	-	ULN2024A

*Also available for operation between -40˚C and +85˚C.
To order, change prefix from 'ULN' to 'ULQ'.

Dwg. No. GP-006

x = Digit to identify specific device. Specification shown applies to family of devices with remaining digits as shown. See matrix above.

VSB Relay

UL SP 4035 (‡) S VDE ÖVE

16 Amps. Miniature Slim Type Power Relay
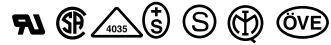
■ FEATURES

- All or Nothing Relay
- UL, CSA, VDE, SEV, SEMKO, IMQ, ÖVE, BSI Recognized
- Working Class : C
- Type of Service : Continuous Duty
- Heavy Duty 16A Miniature Power Relay
- UL Class B(130˚C) Insulation
- High Isolation in Small Package
  - Insulation Distance : 8mm
  - Dielectric Strength : 5,000VAC
                     (between coil and contacts)
  - Surge Strength : 10,000V
- Low Power Consumption and high Sensitive Type Available (VSB-S)
- Washable (With Tape) Type Available
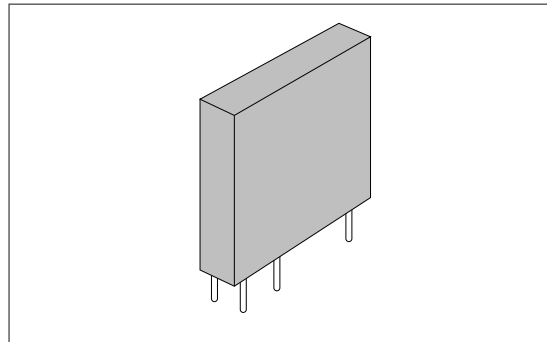
■ STRUCTURE
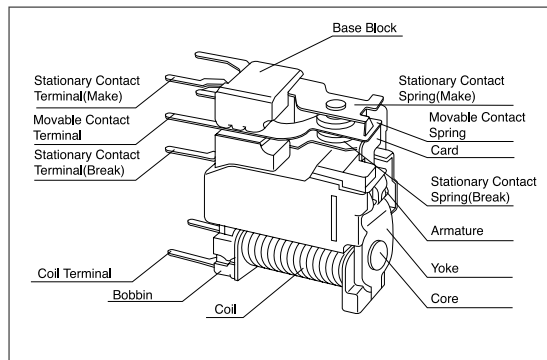
■ SPECIFICATIONS

CONTACT

- Arrangement .... 1 Form A (SPST-NO) or
                                       1 Form C (SPDT)
- Material .... Silver alloy
- Type .... Single Type
- Resistance (initial) .... Max. 200mΩ (at 6VDC 1A)
- Ratings (resistive)
  Nominal Load .... 16A 250VAC or 30VDC
  Max.Switching Power 4,000VA, 480W
  Max.Switching Voltage 380VAC, 150VDC
  Max.Switching Current 16A
  Max.Carrying Current 16A
  Max.Switching Load(∗1) 5VDC 100mA
- Life Expectancy
  Mechanical .... 5×10^6 operations
  Electrical .... 1×10^5 operations (at nominal load)

COIL

- Nominal Voltage .... 3 to 100VDC
- Nominal Power (at 20˚C) .... Standard Type   : 0.70 to 0.75W
                                       High sensitive Type : 0.53W
- Operate Power (at 20˚C) .... Standard Type   : 0.35 to 0.37W
                                       High sensitive Type : 0.26W
- Operate & Release Voltage .... Please see Coil Data Chart
- Max. Contious Voltage .... Please see Characteristic Data

GENERAL

- Insulation Resistance .... Min. 1,000MΩ at 500VDC
- Dielectric Strength .... 1,000VAC 1 minute
  IMQ ②   (between open contacts)
                                       5,000VAC 1 minute
                                       (between coil and contacts)
- Surge Strength 10,000V
  IMQ ▽   (at $1.2 \times 50\mu$s standard surge wave)
- Temperature Range .... Standard Type   : -30˚C to +65˚C
  (at nominal Voltage)   High sensitive Type : -30˚C to +75˚C
- Time Value .... Operate Max. 20ms
  (at nominal voltage)   Release Max. 10ms
- Vibration Resistance
  Misoperation .... 10 to 55 Hz,
                                       double amplitude of 1.5mm
  Endurance .... 10 to 55 Hz,
                                       double amplitude of 1.5mm
- Shock Resistance
  Misoperation .... 100 m/s² (11 ±1ms)
  Endurance .... 1,000 m/s² (6 ±1ms)
- Unit Weight .... Approx. 18g
- Enclosure .... Polybutylene Terephthalate(PBT)

(∗1) Min. Switching Load mentioned above are reference values. Please perform the confirmation test with the actual load before production since reference values may vary according to switching frequencies, environmental conditions and expected reliability levels.

VSB Relay

■ SAFETY STANDARD & FILE NUMBERS
UL 508 (File No. E56140. E108658)
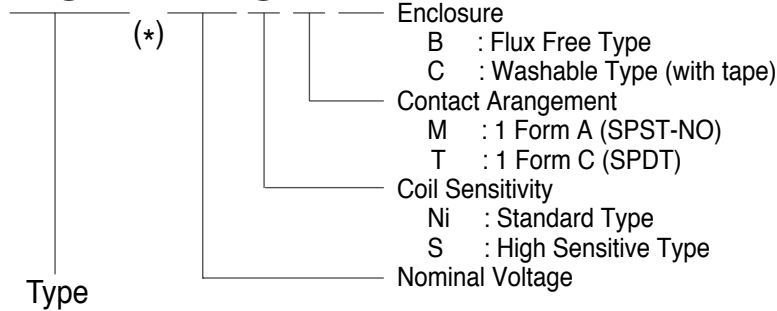**C22.2 No.0, No.14 (File No. LR35579)**
VDE 0435, 0631, 0700

Please be noted that UL/CSA rating may differ from the Standard ratings.
Please request when the approval markings are required on the cover.

Relay type	Nominal coil Voltage	contact ratings	
VSB	3 to 100VDC	1/3HP 125VAC/250VAC	
		16A 30VDC/250VAC, Resistive	
		Pilot duty C 150	

■ ORDERING INFORMATION

V S B - 1 2 S T B

(∗)

Enclosure
  B : Flux Free Type
  C : Washable Type (with tape)
Contact Arangement
  M : 1 Form A (SPST-NO)
  T : 1 Form C (SPDT)
Coil Sensitivity
  Ni : Standard Type
  S : High Sensitive Type
Nominal Voltage

Type

Note) 1. Actual making omits the hyphen (-) of (∗)

■ COIL DATA CHART

	ORDERING CODE	Coil Nominal Voltage V DC	Coil Resistance Ω ± 10% (at 20°C)	Must Operate Voltage V DC (at 20°C)	Must Release Voltage V DC (at 20°C)	Coil Nominal Power W (at 20°C)
Standard Type	VSB - 3( )( )	3	12.5	2.1	0.3	0.72
	VSB - 5( )( )	5	36	3.5	0.5	0.70
	VSB - 6( )( )	6	50	3.5	0.5	0.72
	VSB - 9( )( )	9	115	6.3	0.9	0.70
	VSB - 12( )( )	12	200	8.4	1.2	0.72
	VSB - 14( )( )	14	280	9.8	1.4	0.70
	VSB - 18( )( )	18	460	12.6	1.8	0.70
	VSB - 24( )( )	24	820	16.8	2.4	0.70
	VSB - 36( )( )	36	1,850	25.2	3.6	0.70
	VSB - 48( )( )	48	3,300	33.6	4.8	0.70
	VSB - 60( )( )	60	5,100	42.0	6.0	0.70
	VSB - 100( )( )	100	13,400	70.0	10.0	0.75
High Sensitive Type	VSB - 3S( )( )	3	17	2.1	0.3	0.53
	VSB - 5S( )( )	5	47	3.5	0.5	0.53
	VSB - 6S( )( )	6	68	4.2	0.6	0.53
	VSB - 9S( )( )	9	155	6.3	0.9	0.53
	VSB - 12S( )( )	12	270	8.4	1.2	0.53
	VSB - 14S( )( )	14	370	9.8	1.4	0.53
	VSB - 18S( )( )	18	610	12.6	1.8	0.53
	VSB - 24S( )( )	24	1,100	16.8	2.4	0.53
	VSB - 36S( )( )	36	2,450	25.2	3.6	0.53
	VSB - 48S( )( )	48	4,400	33.6	4.8	0.53
	VSB - 60S( )( )	60	6,800	42.0	6.0	0.53
	VSB - 100S( )( )	100	18,860	70.0	10.0	0.53

⚠ Safety Instruction on Service

- Unplug the refrigerator before making any repair or any replacement.
  ▷ Avoid the electric shock.

- Use the rated components on the replacement.
  ▷ Check the correct model, rated voltage, rated current, operating temperature and so on.

- On repair, be sure that the wires such as harness are bundled tightly and are not permeated by water···
  ▷ Bundle wires tightly in order not to be detached by the external force.

- On repair, remove completely dust, particles or other things on housing parts, harness parts, and check parts.
  ▷ Cleaning may prevent fire by tracking or short.

- Check if there is any trace indicating the permeation of water.
  ▷ If there is that kind of trace, change the related components or do the necessary measure such as taping using the insulating tape.

- After repair, check the assembled state of parts.
  ▷ It must be in the same assembled state when compared with the state before disassembly.

- Check the surrounding conditions of the installed refrigerator.
  ▷ When the refrigerator is located at humid or wet place, or the installed state is unstable, change the location.

- If needed, do the grounding
  ▷ Especially, if there is a possibility of the electric leakage, this appliance must be properly grounded.

- Do not allow consumers to use one consent for several plugs.

- Check whether the power cord is placed under other appliance and so, damaged, frayed squeezed.
  ▷ Repair immediately the defective power plug or consent.
  ▷ Make sure that the power cord does not come to be placed under other appliance or squeezed.

- Do not allow consumers to keep bottles or the likes in the Freezer Room or to keep foods in unstable state.

- Do not allow consumers to repair the appliance for themselves.

- Do not allow consumers to keep other things except food.
  ▷ Medicines and other materials for research : this appliance will not maintain the strictly controlled condition.
  ▷ Volatile material(alcohol, benzene, ether, LP gas etc.) : possibility of explosion

MEMO

MEMO